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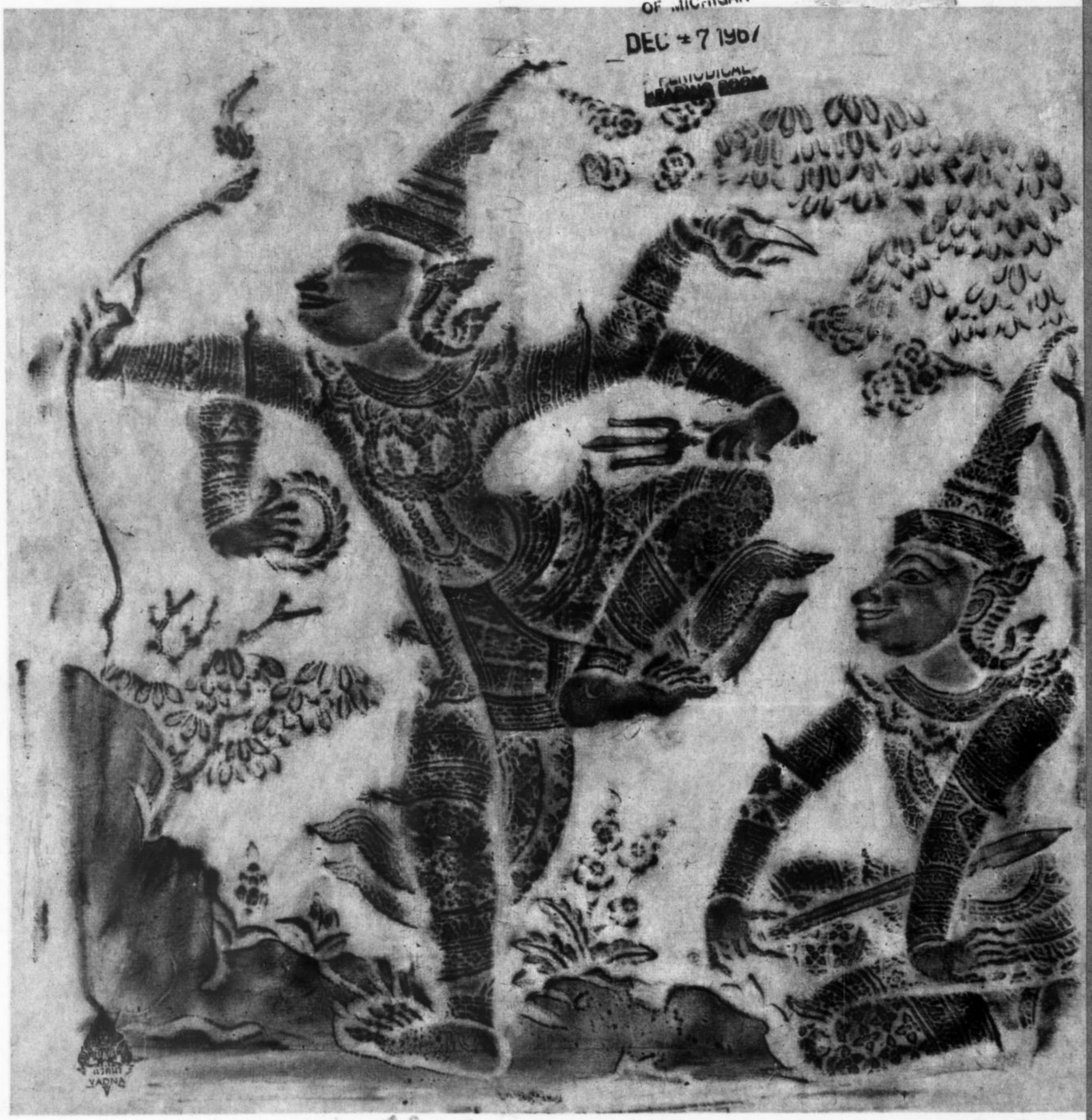
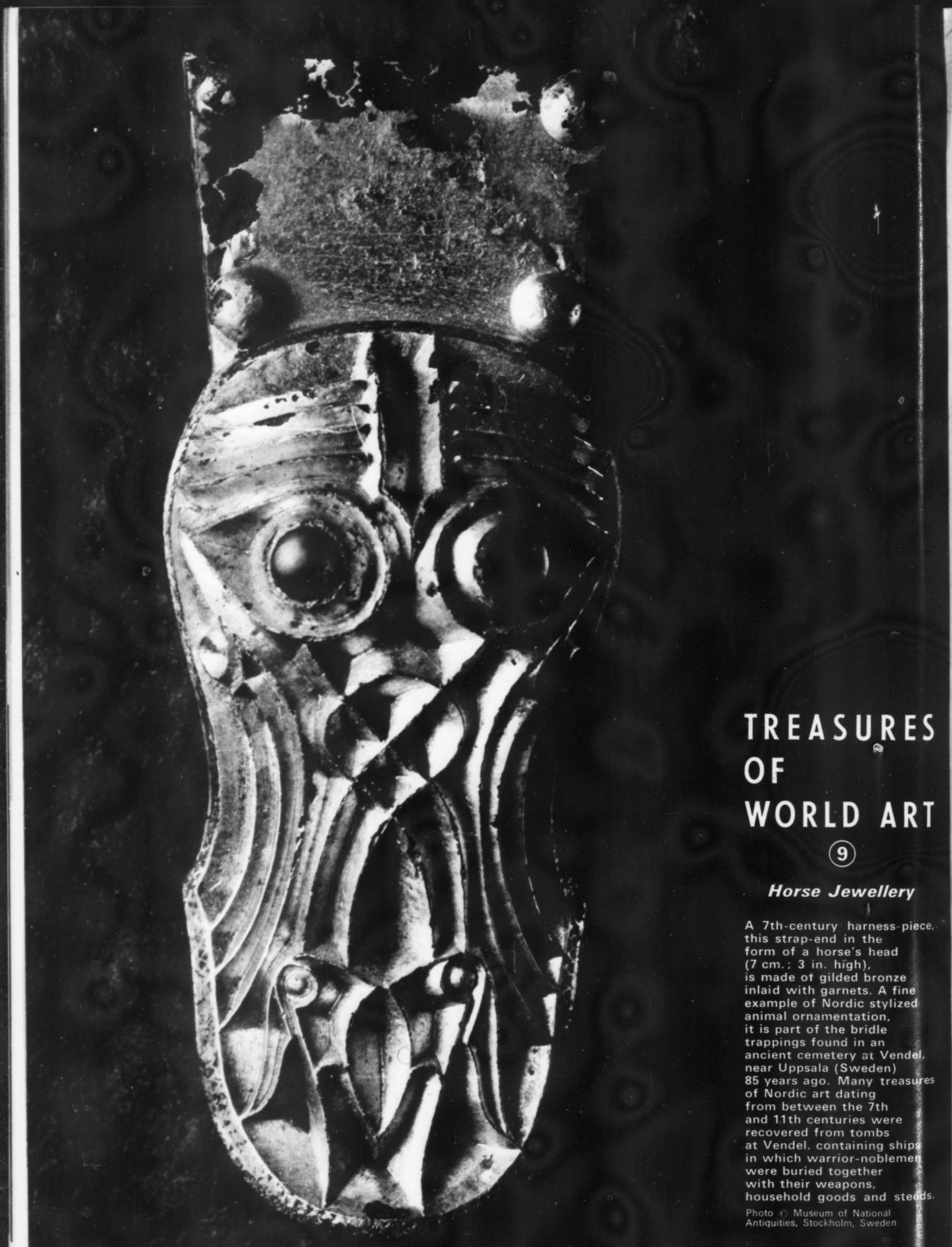


Capital of ancient Siam

AYUTYA - VENICE OF SOUTH ASIA



TREASURES OF WORLD ART

9

Horse Jewellery

A 7th-century harness-piece, this strap-end in the form of a horse's head (7 cm.; 3 in. high), is made of gilded bronze inlaid with garnets. A fine example of Nordic stylized animal ornamentation, it is part of the bridle trappings found in an ancient cemetery at Vendel, near Uppsala (Sweden) 85 years ago. Many treasures of Nordic art dating from between the 7th and 11th centuries were recovered from tombs at Vendel, containing ships in which warrior-noblemen were buried together with their weapons, household goods and steeds.

Photo © Museum of National Antiquities, Stockholm, Sweden

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Cover photo

Photo © Chicago Natural History Museum - Vadna Gearhart

The Thai Government has approved a 20-year project to restore Ayutya, the ancient capital of Siam, which, until the middle of the 18th century, was a busy, bustling city criss-crossed by innumerable canals and richly endowed with artistic treasures. This rubbing of a sculptured stone relief is one of 153 panels depicting the story of Rama, a hero of Hindu mythology. This "Ramayana" in stone once decorated a temple in Ayutya and is now in the Temple of the Sleeping Buddha, in Bangkok, the capital of Thailand.

The Thai Government has approved a plan to restore the capital of ancient Siam, now half-buried in the jungle

AYUTYA
VENICE OF SOUTH ASIA

by Sumet Jumsai na Ayutya

SOME eighty miles north of the Gulf of Siam, up the river Chao Phya, past and beyond Bangkok, we come to the heart of the Indochinese Peninsula. Here amid the fertile expanse of the delta lands and rice fields is situated a ruined city, its derelict pagodas and its clusters of jungle foliage outlined against the skyline. As one approaches this green mass of vegetation, more pagodas and other structures such as brick arches of former bridges, walls and ramparts can be seen. Hidden under all this, under the trees and the reeds, one of the world's most fascinating cities lies buried.

This is Ayutya (variously written as Ayudhya, Ayuthia, Ayutthaya, and Ayut'ia) the biggest and most cosmopolitan city of the seventeenth century south of China. Originally the city dates back to the eighth century when the Thais were still predominently in

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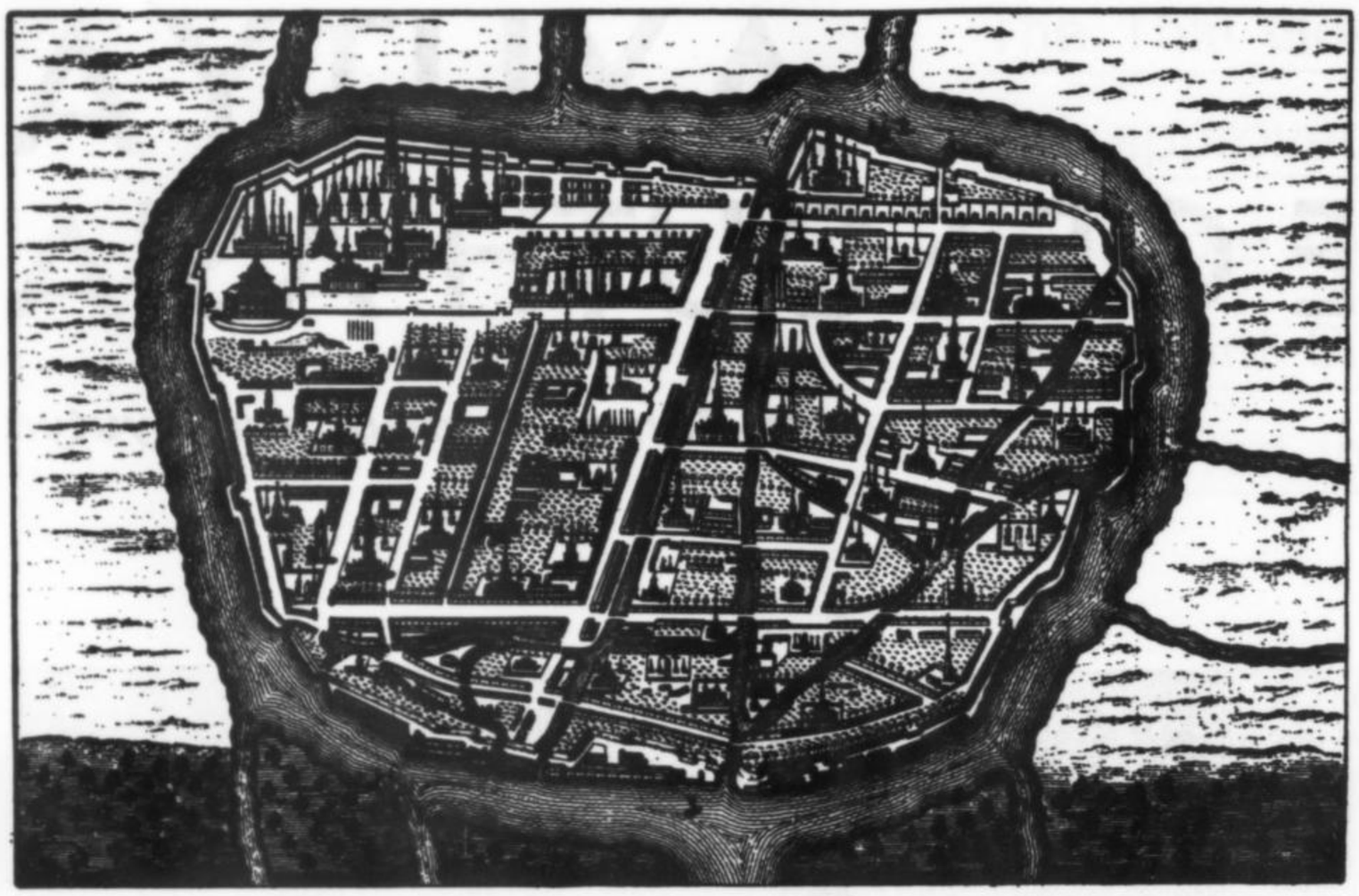
Photo-Unesco

Until a few years ago, Ayutya was completely buried beneath a mass of jungle vegetation. Standing out above the trees (above), are the slender pinnacles of the three stupas of Wat Phra Sri-sanphet, the greatest and most beautiful of the city's temples.

A colossal statue of the Reclining Buddha (right), measuring 28 metres (90 ft.) today lies amid the ruins of Ayutya, Siam's ancient capital which was destroyed in 1767. The statue is thought to date from the 16th century, and is named after the temple, which once housed it—the Wat Lokaya-sudha (Temple of Water of Immortality on Earth). Left, detail of the statue.

Photos © Paul Almasy, Paris



An early 18th-century plan of Ayutya drawn by a Dutch cartographer. It reveals the astonishing originality of this city built amid the waters. A network of canals criss-crossed the city, constructed on a natural peninsular formed by the meandering Menam river. A by-pass canal made the peninsular into an island. A bustling activity reigned in this Venice of the East, whose ruined buildings today reveal architecture of exceptional richness and variety. Right, the impressive royal temple of Wat Phra Sri, now freed from its jungle shroud. Excavations here have brought to light hundreds of images of the Buddha as well as objects in gold, silver and crystal, now preserved in the Bangkok Museum.

AYUTYA *(Continued)*

Water-city of a hundred gates

what is now the southern Chinese province of Yunnan, and when Angkor, built on a monumental scale, was the most thriving urban centre with its empire ruling over most of the Indochinese subcontinent.

Kublai Khan of the Yuan Dynasty conquered the Thais of Yunnan in 1250 and made that province part of China once and for all. This led to an emigration of the Thais southwards where several independent Thai kingdoms or city states were already being formed at the expense of the Kmer Empire, and on the decline of its capital city, Angkor.

Ayutya was the last to emerge towards the end of the fourteenth century as the capital of Siam which was to become the most powerful of the Thai kingdoms and the only one to remain independent throughout its history. Ayutya continued to be the Siamese capital until 1767 when a Burmese army destroyed it completely. Since then the seat of government has been Bangkok.

Most of the Thais remained a mountain or valley people, like those who stayed in Yunnan or those who settled immediately south of China, from Assam and the Shan States to Laos and most of what is now North Viet-Nam. But those who penetrated further south into the rich delta lands very quickly developed into an "aquatic" society, with paddy rice cultivation and waterways as the source of their wealth and power.

The first immigrants, then, came into the powerful Kmer Empire. They came into contact with a highly advanced "hydraulic" society whose power was founded upon rice agriculture which was served by the most gigantic hydraulic installation ever devised. In the centre of this system, and controlling it, stood the city of Angkor.

The world at that time had many water towns and cities with varying degrees of hydraulic sophistication. Before Angkor, there had been Shantan in China which was conceived and built as a gigantic urban machine operated and serviced by water. Soochow, in the Kiangsu Province, which is probably the most beautiful and completely planned canal city, dates at least one thousand years before Venice and its contemporary, Angkor, and therefore well before the Dutch water towns, before Ayutya, Tenochtitlan (Mexico City), which incidentally has become a completely "dry" city, and still later cities like Batavia (Jakarta) and Bangkok (both now becoming more or less "dry"), and St. Petersburg (Leningrad) still invariably known as the "Venice of the North".

But Angkor was different in that it came into being through the coincidence of three factors: geography, technology, and urban symbolism. The particular geography with its floods and draining direction dictated a particular form of water "sculpture" which was relevent to both hydraulic engineering and cosmo-magic orientation. The Kmer city was the microcosm of Hindu cosmology with its formal disposition of the water and the solid elements.

The Thais of the emerging Siam were pragmatists and flexible in their outlook. Although extensive canalization was embarked upon, the precise and somewhat vulnerable hydraulic planning of the Kmers made no impression on them. There was no real attempt to control water; instead, the whole society was part of water, living on it and flowing with it. Monumental structures and rigid urban symbolism gave way to what was the most practical and easiest solution of building a city. Therefore they chose first of all an existing settlement complete with the essential urban organization which was well placed in

Photo Unesco - Sandy Koffler

the middle of the rich delta lands. This was the eighth century city of Ayutya.

Aerial photographs and a preliminary analysis show that Ayutya was a city of canals, with building compounds defined by and integrated into a network of waterways. In 1350, soon after the arrival of the Thais, the old site lost its importance when a newer urban centre was built immediately to the west, in a natural peninsula formed by a big meandering river. A by-pass canal was constructed to make the peninsula into an island. Here was the Siamese solution of doing the least work in exchange for a maximum result.

The city was given a wide moat and a "ring road" which was always made navigable and flushed by the action of nature. Gradually two more big rivers nearby were linked to the new urban centre by the numerous by-pass canals. The newer city, now known as Ayutya, became the junction of three very important rivers. To the north, it gained access to and control over the northern Thai kingdoms; to the south the river led to the open sea and the control of the Malay Peninsula as well as the international trade between India and Japan.

Agricultural products and trade converged upon Ayutya on boats. The canals were the all-weather highways. From the "ring road" or moat, they were led through water-gates into the innumerable canals within the confines of the city wall, and eventually to the palaces, market-places, temples, schools, and private house compounds. There were up to 19 water gates, 15 main land gates with water landings, and numerous other smaller gates, giving a total of about 100 city gates. The city wall with some 17 forts for cannons, each guarding the main approaches of water traffic, enclosed an area of about seven square kms (3 square miles).

As far as present research reveals, the number of canals within this area is staggering. The canals were straight and gridiron in plan. Many had brick-paved streets alongside, and all were lined with big trees, giving both pedestrians and water traffic ample protection from the tropical sun. With so many canals and streets, there must have been many bridges, but only 29 are named and identified by an old record. Half of this number were very high brick arches to allow for water traffic. One was constructed of laterite to accomodate elephants.

There were three palaces. The main Royal Palace was a complete walled-in city in itself and was subdivided into the king's private residence, and an outer walled compound containing various offices of the civil service. Private houses were simple constructions of wood, for all the effort was concentrated on the 350 or more monasteries, many of which had their own schools and libraries.

The Chinese who had the special privilege of living within the city walls, had their Chinatown. This was the most opulent secular quarter, with shops and warehouses of brick and stucco. Here a European of Greek origin took up residence in an elegant building, then entered the Siamese civil service and became the First Minister of the Crown in 1686. Further along, behind the main forts overlooking the dock for sea vessels, he founded a college named after himself, Constantin (Phaulkon) College.

The king had his own private dock next to the Royal Palace where the royal barges were kept. The city was subdivided into administrative units and quarters according to the different activities and types of industry. The centre was marked by a simple tower, housing a drum from which the hours were struck.

CONTINUED ON NEXT PAGE

Photo © Paul Almasy, Paris

8 **Thailand has been called the land of Buddhist images. One of the most familiar sights in the ruins of Ayutya are the images of Buddha, though many, like the one shown here, are now disfigured. This statue stands near the Wat Chao Phya-thai (The Temple of the Supreme Patriarch), a former monastery for monks of a sect devoted to meditation.**

A royal procession with 3,000 barges and 20,000 boats

The population seems to have varied a great deal. The success of a military campaign could mean tens of thousands of people being brought to settle at Ayutya. The city and its environs would then exceed the half million mark. But when the Burmese besieged the city in 1569 with an army of over a million men and eventually took it, only some 10,000 people were left behind among the ruins. (According to Europeans observers, in this particular war the Burmese army was over two million men strong, and after its capture, Ayutya had a mere 4,000 inhabitants!)

Whatever the actual population in normal times, there appears to have been a great number of boats and a huge "floating" population. For a royal procession on water up to 30,000 attendants might be gathered on some 3,000 barges, all fantastically sculptured and gilded, and flanked by 600,000 people on 20,000 boats along both banks of the processional waterway.

It was truly a water city, rightly known to the Europeans of the sixteenth and seventeenth centuries as the "Venice of the East". But it was more than this, for people were integrated into the water pattern. The whole society seemed to float and flow along the innumerable canals and rivers without calculation and struggle. This aquatic phenomenon may be equated with the sense of flexibility of the Siamese which accounts for their political survival.

Certainly Siam had dealt astutely with the various European powers from the beginning of the seventeenth century when its first embassy to Europe was dispatched to Holland in 1609 as the result of the growing Dutch trade and influence. Then there were the famous exchanges of embassies with Versailles in the 1680's, when an embassy was also sent to the Vatican. According to a member of the French embassy in Ayutya at that time, there were 40 different nationalities represented at the Siamese court.

Foreigners were allowed to build their own towns and religious establishments around the city proper. The Dutch, Portuguese, and Japanese towns occupied the best commercial

CONTINUED ON PAGE 10

After its capture and destruction, Ayutya fell prey to plunderers and vandals who despoiled and defaced pagodas and shrines in their search for treasure. Traffic in works of art led to further ravages. Innumerable heads, like this one abandoned in the ruins, were removed from statues of the Buddha.

Photo Unesco - Sandy Koffler

A unique contribution to world civilization

positions, these being on the southern approach of all sea shipping. The king participated directly in the international trade, maintained his own bank for money loans, and kept a private commercial fleet for shipping between India and Japan.

Where now there is nothing but dense undergrowth and rice fields, there once flowed a rich life, full of bustling activities and colour, all based on water. The comings and goings of embassies and merchants, the ceremonial processions, the floating markets, music, court dancing were the essence of this remarkable aquatic society. When the city was sacked in 1767, its treasures were removed and its archives burnt. Robbers began a systematic uprooting of pagodas to find buried treasures. Then the jungle also moved in.

The Thai Government has recently drawn up an ambitious scheme to make Ayutya a national historical park. The project was initiated by the Thai Department of Town and Country Planning which prepared a detailed plan in conjunction with the Fine Arts Department. Apart from its other cultural activities, this department is responsible for looking after all historical monuments throughout the country.

The Department of Town and Country Planning is a newly-established office which, in drawing up development plans for towns and cities, not only considers the modern environment but also envisages the incorporation of existing historical landmarks into the overall design. It so happens that most of the towns throughout the kingdom are of an historical nature, and until recently still retained such historical landmarks as city walls and fortifications. Therefore in drawing up development plans for existing historical towns, the two departments work closely together. It was through the initiative of these authorities that the Thai cabinet met two years ago to discuss the problems of preserving what was left of the various city walls and fortifications, and decided to impose a strict order for the conservation of such national monuments.

Ayutya, however, is different from other old towns because of its special significance to the country, having been the capital city of Siam for four centuries before the setting up of Bangkok as capital in 1782. In addition to the chaotic state of the ruins as the result of past vandalism, there are other problems such as modern encroachment, and the future expansion of a small town on the eastern rim of the old city. Some modern buildings have recently been built scattered among the ruins, often at the expense of the latter.

The project aims to make a clear separation between the new town and the historical area. An old canal running north-south from the Palace of the Front to the old Chinatown acts as the demarcation between the modern town on the east, and the historical park on the west. A small part of the former island city will thus be given over to the development of the modern town.

There are two reasons for this. First, the area in question is already partially urbanized, and mass eviction would be undesirable. Secondly, it is felt that the projected historical park immediately to the west should not be completely emptied of local people because their services may be needed to support the future tourist industry. In its final form, the project involves a rational allocation of urban and industrial centres away from the historical park, and a complete restoration scheme for the various ruins and canals.

The project is a 20-year programme divided into three stages. The First Five Year Plan gives priority to the development of the modern town and to the prevention of any further modern encroachment into the historical area. It is assumed that at this stage there will be only a limited budget available for restoration work, all priority being given to Thailand's economic development. Even so, a definite move has been made towards long term planning in this field.

The Second Five Year Plan involves projects for both the modern town and the historical park. As the jungle is cleared away, some of the old canals, brick-paved streets and bridges will be brought to light, and various palaces and temples uncovered and restored. Re-allocation to the modern zone of some of the modern buildings among the ruins will also begin.

The last stage, a ten-year programme, involves clearing away the rest of the jungle and complete restoration work. At this stage many old canals will have been redug, serving not only as tourist attractions, but also as an essential part of a storm drainage system. The older eighth century city of Ayutya further to the south-east awaits a future research and restoration scheme. It should be mentioned that scattered throughout the country lie many walled cities and archæological sites still covered by the jungle, and all awaiting researchers and funds for restoration.

The Ayutya project will see many old waterways revived and buildings and fortifications properly restored. It will soon be possible for a visitor to meander once more along the innumerable canals of the old city among the palaces and pagodas of the past. Thus, it is hoped, the aquatic culture of Ayutya will make a unique contribution to the civilizations of the world.

Photo © Paul Almasy, Paris

Beyond this portico stands the soaring pagoda of the Rajaburana temple built by King Boroma-raja II of Siam in the 14th century. The fire which swept through the city in the 18th century spared the portico and also the pagoda with its magnificent sculpted decorations.

SUMET JUMSAI NA AYUTYA *is a young architect attached to the Department of Town and Country Planning in Bangkok. He is now doing research on urban symbolism and water towns at Cambridge University School of Architecture.*

Photo © Paul Almasy, Paris

Above, detail of a 17th-century sculpted pediment on the Wat Mae Nang Pluen at Ayutya. The central figure represents Garuda, the eagle with a human body and messenger of the god Vishnu. Right, an early 20th-century view of Bangkok. In foreground a drawbridge of Dutch design spans a canal. In rear are temples and pagodas. Bangkok was built in the image of Ayutya, to which it succeeded as capital of Siam, today Thailand. The scene evokes an image of Ayutya at the time when it was one of Asia's great "water cities."

Photo © British Museum, London

Vast chains of submarine mountains shown in this detail of a physiographic diagram of the Indian Ocean belong to globe-girdling mid-ocean ranges, estimated to be 40,000 miles long. Part of this system runs through the Indian Ocean into the Arabian Sea and then, via the Gulf of Aden, enters Africa along the Great Rift Valley. Shown in grey are Mozambique and part of the East African coastline, Madagascar and the islands of Reunion and Mauritius. Published by the Geological Society of America, the diagram is based on soundings made by vessels of the 25-nation Indian Ocean Expedition (1959-1965), co-sponsored by Unesco and the Scientific Committee on Oceanic Research of the International Council of Scientific Unions.

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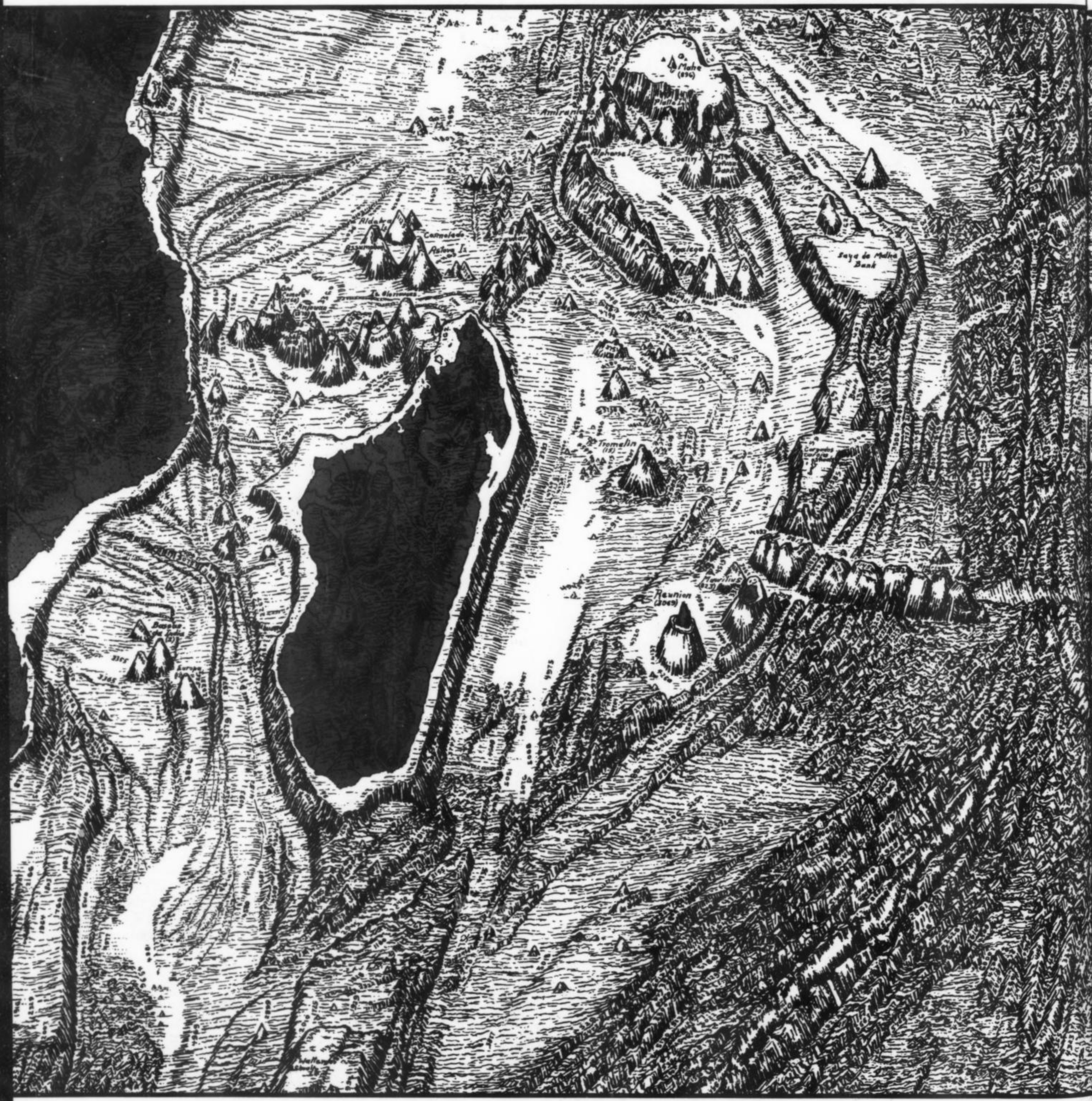

THE CONTROVERSY ON CONTINENTAL DRIFT

by Daniel Behrman

NOT so long ago, it was fashionable to remark that we knew less about the ocean floor than the face of the moon. Despite progress in space exploration, this is no longer true. The Second International Oceanographic Congress, held in Moscow last June, heard reports of what can only be described as a breakthrough—no matter how much scientists hate the word—in man's knowledge of the ocean floor and, consequently, of the processes that shape the earth (1).

Papers read at the congress by marine geologists from a number of nations—and notably Britain, the United States and the U.S.S.R.—showed huge progress not only in charting the ocean floor but in our understanding of how it works.

For it does "work." Our planet's youngest rocks are on the bottom of the sea and intense "manufacturing" activity takes place along the mid-ocean ridges that have now been found in every ocean.

One of the most startling interpretations of marine geophysical findings heard at the congress was presented by Dr. Bruce Heezen, Dr. Dragoslav Ninkovich and Dr. Neil Opdyke of Lamont Geological Observatory at Palisades, New York. They correlated reversals in the earth's magnetic field during the past three million years with major evolutionary mutations in marine life.

A sampling of 5,000 cores drilled out of the sea bottom in all oceans to a depth of ten metres of sediment suggests, they stated, that the earth's magnetic field has first disappeared and then reversed at intervals between half a million and a million years.

No magnetic field means no magnetic shield. And this means intense bombardment of the earth by cosmic rays producing a disastrous effect on life. "Some species are completely killed off, other species are created," Dr. Heezen noted. "Of current interest is the fact that the magnetic field is now decreasing and if this drop continues for 2,000 years, it will be zero. I don't want to sound like an alarmist but we may be next."

In the background of this research can be found the impressive advances recorded by marine geophysics in the last seven years.

One such advance has been the magnetic surveying of the deep ocean. Off the coasts of California and Canada, a strange pattern of zebra stripes running north and south was recorded by magnetometers. A similar pattern was found by Soviet researchers in the Arctic.

One theory of their origin is that new rock is polarized magnetically as it spews out of the median crack in mid-ocean ridges and is laid down on the sea floor. When it cools, this magnetism is frozen and remains constant as "paleomagnetism" despite later reversals in the magnetic field. The stripe is formed when new rock appears after a reversal.

In the research described by Dr. Heezen, pencil-sized samples of deep-sea sediment cores were placed in magnetometers. The results imply that our magnetic north has been north only for the past 700,000 years; before that it was reversed for a time, so that a compass would have pointed south. These reversals, he explained, could be caused by disturbances within the earth's core which acts as a dynamo.

Nine hundred thousand years ago there was another brief reversal; others occurred 1,900,000 years and 2,400,000

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(1) The Congress, organized by the U.S.S.R. government and the Soviet Academy of Sciences, under the auspices of Unesco, enabled over 1,700 oceanographers from 57 countries to take stock of progress in the study of the sea since the First International Oceanographic Congress was held seven years ago in New York. Under the general theme of "Ocean Research for the Benefit of Mankind," the Moscow congress covered four major fields of study: ocean and atmosphere, ocean and life, marine geology and oceanography of the Antarctic and the Indian Ocean (special studies of the findings of the 25-nation Indian Ocean Expedition—1959-1965).

Photo © Les Requins Associés, Paris

When the North was at the South Pole

years ago. Study of the cores shows, Dr. Heezen stated, that the earth's magnetic field did not simply change direction but disappeared for a period as long as 10,000 years.

During this period of full exposure to cosmic rays, drastic changes occurred. Examination of fossil organisms in cores showed, for example, that one microscopic species of radiolaria had no spines before magnetic reversal but sprouted them afterwards.

The magnetic zebra-striping, already detected on two per cent of the earth's surface, is not all that marine geologists have found on the ocean floor. Their main achievements were reported to the congress in a masterly review by Sir Edward Bullard, head of the department of geodesy and geophysics at Cambridge University.

Next in importance, he ranked the discovery of continental blocks in the middle of the ocean—that is, islands formed of old granite rather than the young basalts of the ocean floor. The Seychelles group, for example, is "a continent in everything but size" geologically speaking, and he suspected other oceanic areas as being of continental origin as well. Continental rocks are much less magnetic than oceanic rocks, thereby giving away their origin.

Work has also been done on the structural transition of the earth from the continent to the ocean. Magnetic surveys show that the old pre-Tertiary folding of Western Europe's mountains can be traced out across the continental shelf... where it suddenly ends. The folding of younger ranges like the western Andes, however, has been followed magnetically all the way into the ocean basin.

Sir Edward then touched on the theory of continental drift seen in certain quarters as confirmed by the intense activity of the mid-ocean ridges. The theory was discussed in much greater detail by Dr. Robert S. Dietz, of the Environmental Science Service Administration in Washington, who regaled congress participants with slides showing how continents might once have fitted.

The most classic example of such a fit is what Dr. Dietz called "the knee of South America into the groin of Africa." Working with computers, he has been able to fit India against Australia, Magadascar against India and Australia against Antarctica. A few missing pieces—each the size of Texas—are needed to complete this picture, and Dr. Dietz thinks they are lying on the floor of the Indian Ocean.

His studies have led him to discard the idea of a single, primordial world continent, known as Pangaea, in favour of two super-continents each measuring 32 million squares miles—Laurasia in the Northen Hemisphere and Gondwana in the Southern.

Dr. Dietz and other proponents of the drift theory believe that the process began 150 million years ago, went on energetically for 50 million years and has reappeared less markedly in the past 20 million years. On the basis of movement observed along the San Andreas Fault in California, he estimates the present rate of drift at from 1 to 5 cm (½ to 2 in.) a year.

However, the big question among geophysicists at the congress was not *whither* but *whether* we are drifting. Prof. V. V. Beloussov, of the Institute of Geophysics of the U.S.S.R. Academy of Sciences, is still far from convinced (see the Unesco Courier, Oct. 1963).

At the congress, he marshalled a number of impressive arguments. In particular, he maintained that processes affecting the earth's crust are rooted deep in its mantle, as much as 700 to 1,000 kms (430 to 620 miles) down. This leads him to believe that the crust cannot move over the mantle—and also that movement of a layer of several hundred kilometres of crust and mantle is impossible for mechanical and other reasons.

Continental drift is one of those geo-

Diving saucers and sea-going laboratories

SCIENTIFIC tangles plaguing the world's oceanographers may finally be unravelled by new tools now being put at the disposal of researchers (see photo story on following pages). Previews of many of these devices were offered recently at the Second International Oceanographic Congress in Moscow.

Despite the arrival of many novel instruments of oceanic exploration including floating islands, undersea laboratories, buoys and diving saucers, the research ship has not yet had its day. Two of the newest afloat were described at the Moscow congress.

One, the *Akademik Kurchatov*, was built for the expedition service of the U.S.S.R. Academy of Sciences, and has been outfitted in Leningrad prior to her maiden cruise in the Atlantic Ocean from North Africa to Iceland.

With a displacement of 6,800 tons and an overall length of 124 metres (406 feet) she is the biggest ship ever constructed specifically for oceanographic research. She carries eighty-four

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Diving saucer, a French underwater research vessel, skims the sea bed after being launched from its mother ship. Light and highly manœuverable, it can carry out exploration missions down to depths of 300 metres (1,000 ft.).

The 6,800-ton "Akademik Kurchatov", recently acquired by the expedition service of the U.S.S.R. Academy of Sciences, is the largest ship ever built specifically for oceanographic research. It carries 84 scientists and houses 22 laboratories and is almost as manœuverable as a rowboat. It has a separate electric motor and propeller on its rudder for working at slow speeds and can turn a full circle while advancing only 14 metres (45 feet).

Photo © APN

iogical theories, that have, as Sir Edward Bullard remarked in his lecture, "the great merit of suggesting numerous experiments and observations to verify or refute them."

One way to verify or refute continental drift is to drill a hole in the earth's mantle under the ocean floor to see if it consists only of new rocks —which would indicate that the continents have moved apart in the past 100 million years.

This is the purpose of the Mohole project designed by the United States to probe through the Mohorovicic discontinuity layer between the crust and the mantle. At the congress, Dr. Henry Menard, of the Scripps Institution of Oceanography in the United States described the phases of the project. Its floating platform is expected to be ready in two years when it will be taken to a point 1,000 kms (620 miles) west of Southern California to drill about 350 metres (1,200 ft.) into the sea bottom at a depth of four kms (2½ miles).

If this experiment succeeds, the next point of research will be 500 kms (310 miles) northeast of Oahu in the Hawaiian Islands where an attempt will be made to drill at a depth of 4.5 kms (about 3 miles) through another 4.5 kilometres of the sea floor down to the mantle. It is planned to drill ten holes in the next twenty years.

Prof. Beloussov also reported on a Soviet project now under consideration to drill down seven kms (about four miles)—this time on land—in the Kola Peninsula of northern Russia where there is a possibility of reaching the basaltic layer of the earth's crust.

"These two projects form an ensemble," Prof. Beloussov commented.

Drilling holes, therefore, is the next step in geophysical exploration of the ocean bottom but it will have to await the proper tools. Once they are ready, they will spur marine geology in the future as much as the development of "sparkers" and "air guns" as sound sources replacing explosives in seismic refraction work has done in the recent past.

Few sciences are evolving as fast as oceanography, and oceanographic research, while supplying answers to many vital problems, is also opening up new fields of investigation. Commenting on the results of the Moscow congress, a Canadian scientist, Dr. Robert W. Stewart, of the University of British Columbia, observed: "The area of our known ignorance has been greatly extended."

Dr. Stewart is wrestling with one of the trickiest problems facing oceanographers—the interaction between the ocean and the atmosphere, and the consequent effects of the sea on the weather.

Recent research has brought out that half a day of 60-knot winds affects the ocean more than a month of 15-knot winds, setting up momentum that remains in the sea as much as a year. Dr. Stewart felt that further investigations should concentrate on the effects of very local storms.

An example of such air-sea interaction on a global scale was reported to the congress by Prof. Jakob Bjerknes, of the University of California, who presented an apparent paradox: when surface waters are warm in the equatorial Pacific, Europe has a cold winter.

Prof. Bjerknes turned to the period from 1955 to 1958 when this phenomenon appeared. It began when the prevailing easterlies along the equator weakened to the point where they no longer drove currents hard enough to produce normal upwelling of cold water from the depths. The Pacific's "equatorial heat source" of warm water became much greater.

This was a case not of winds driving the ocean but of the ocean driving the winds. "When heat is high in the equatorial zone from South America to the mid-Pacific, the Northern

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DIVING SAUCERS *(Continued)*

scientists, twenty-two laboratories, a helicopter and a meteorological rocket launcher.

The other is the *Silas Bent*, a 2,364-ton ship operated by the United States Naval Oceanographic Office, and probably the most automated oceanographic vessel now in operation. While under way, she can simultaneously measure depth, magnetic intensity, gravity, sea surface temperature and the structure of the bottom. On station, she uses a "sensor package", continuously measuring depth, temperature, salinity, sound velocity and light as far down as 6,100 metres (20,000 feet).

To handle this Gulf Stream of data, she is equipped with a "central data recording subsystem" where information is immediately processed by an all-purpose digital computer.

Computers like the ones aboard the *Silas Bent* and the *Akademik Kurchatov* can mean the difference between survey and research at sea. Immediate processing of data enables a ship's chief scientist to change his research programme so as to explore an interesting phenomenon—instead of waiting months to learn of its existence. And computers not only record more information but make it more accessible in international banks of oceanographic data.

The congress was given a review of the recent past which has seen such developments as FLIP, an American vessel 108 metres (355 feet) "long" that flips 90 degrees to become the most stable platform ever used at sea (see page 18) and a floating tower used by Soviet oceanographers in the Caspian Sea to make wave measurements.

Some of the least spectacular instruments have proved the most valuable. One is the "Swallow Float", named after the British oceanographer who designed it. This is simply a neutrally-buoyant float which can be set to drift at a given depth and follow a current, and which reveals its position by "pings". Another huge advance is represented by instruments measuring the conductivity and, therefore, the salinity of the sea, thus eliminating much tedious chemical analysis of water samples.

Photo Bureau of Commercial Fisheries Biological Laboratory, Honolulu, U.S. Fisheries and Wildlife Service

DRIFTING LABORATORY. Scientists at the Honolulu Biological Laboratory use this incongruous-looking seaborne house to study the behaviour of fishes, many species of which tend to gather under floating objects at sea. Named "Nenue" (after one of the so-called "rudderfish" that are reputed to follow ships) it has a metal caisson with viewing ports suspended beneath it. From this vantage point, biologists have counted as many as 60 species of fish gathered around the craft. Some of their observations will be of great value to fishermen.

Photo USIS

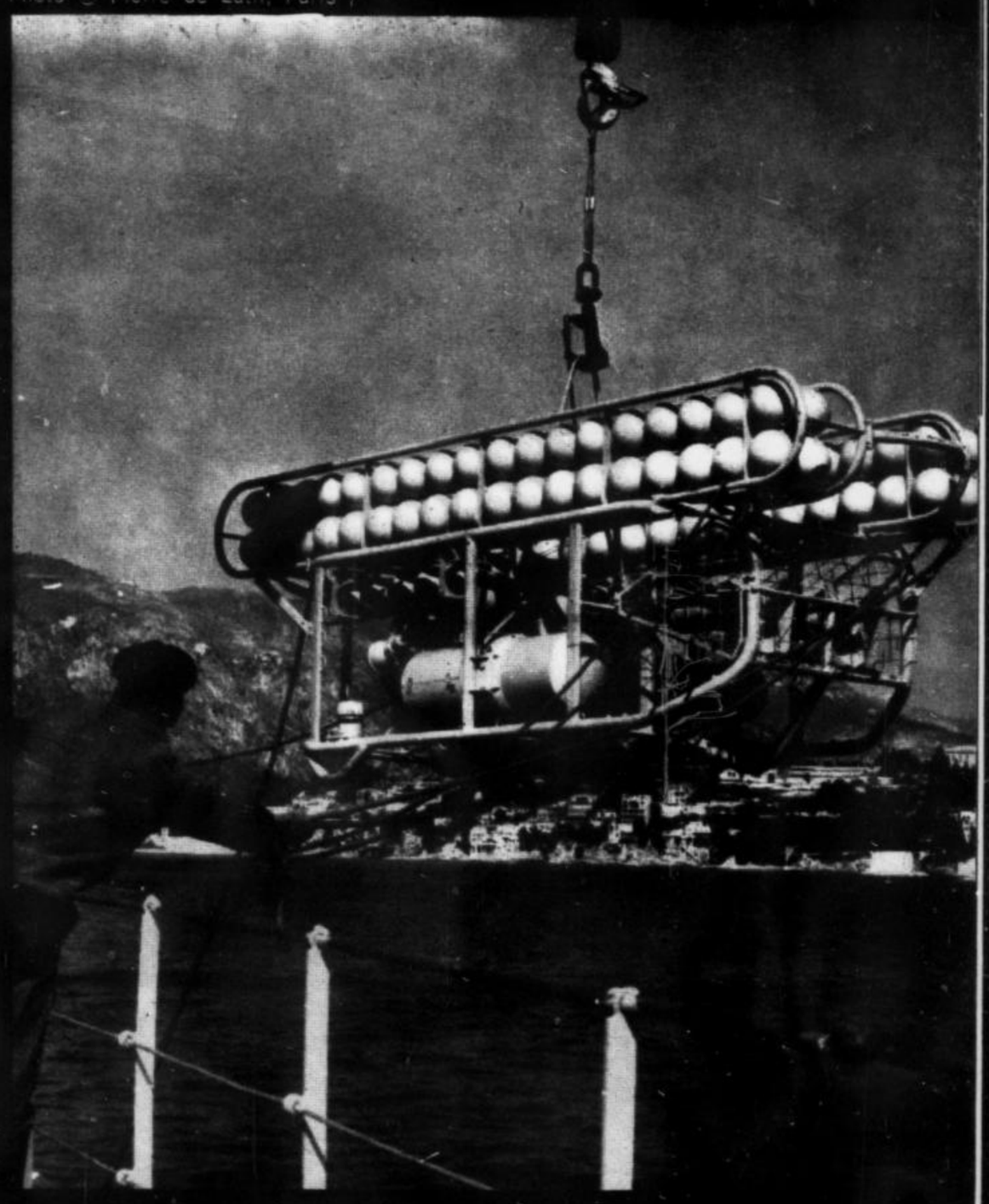
EXPLORING A NEW FRONTIER. For 45 days last year, a group of 28 U.S. volunteer "aquanauts" lived on the ocean floor, half a mile off the California coast, inside a 17 metres (57 ft.) steel cylinder, called "Sealab II", anchored 62 metres (200 ft.) deep. At times the "aquanauts" left the cylinder to engage in oceanographic and marine biology research and to undergo physiological and endurance tests designed to determine man's ability to live and work under the sea. Here, an "aquanaut" repairs transmission apparatus watched by curious spectators at the porthole.

Submersibles have also appeared. Several of them were described, including the *Aluminaut* designed to work nearly 5,000 metres down with six people aboard, the smaller *Alvin* which has already gone down to 2,000 metres (6,500 feet), and the *Deep Star* designed in France. *Telenaut*, a French unmanned submersible equipped with a grappling arm and a television camera, was also presented in Moscow. Intended for oil prospection work, it is linked to a surface ship by a two-way cable transmitting power and commands from above and data from below.

These new undersea vehicles have already made their contribution to research. Geologists find them invaluable in studying the walls of submarine canyons and deep channels.

Another device for work in the very deep ocean is the tide-recording "capsule". It can measure temperature to 1/100,000th of a degree and pressure to a fluctuation of 1 millimetre (1.25 inch) in a water column 5 kilometres (3 miles) deep. It can record 6 million items of data on magnetic tape and can then be recalled by acoustic signal.

Photo © Pierre de Latil, Paris



TELENAUT. This French unmanned submersible, is controlled from a surface ship by a two-way cable transmitting power and orders from above and information from below. Carrying a combined television-cinematograph camera, it can operate at a depth of 1,000 metres (3,300 ft.). When something of interest is picked up on the television screen, it is immediately recorded by the film camera. "Telenaut" is also equipped with a grappling arm capable of lifting objects weighing 50 kilogrammes (100 lbs.).

Photo USIS

MIDGET SUBMARINE. This remarkable underwater research craft, the U.S. midget submarine "Alvin", can carry a crew of two and a wide assortment of scientific instruments to an ocean depth greater than 1,800 metres (6,000 ft.). "Alvin" is 6.6 metres (21 ft.) long and the fibreglass portholes in its pressure sphere are 17 cms. (6 ins.) thick. Equipped with 3 propellers for speed and manœuverability, Alvin can cruise at 4.6 kms. (3 miles) per hour for 30-40 kms. (20-25 miles).

A SHIP NAMED FLIP

A stable platform from which to perform experiments at sea has been a long-sought goal of sea-going scientists. They now have one FLIP (for Floating Instrument Platform), 108 metres (355 ft.)-long, 600-ton craft designed and built in the United States. Here is how FLIP flips. (1) Having no motive power of her own, she is towed in the horizontal position to her research station. (2, 3, 4) As the crew floods the ballast tanks with some 1,500 tons of salt water, the prow gradually rises; the stern slowly sinks. (5) Suddenly, the whole 15 metres (50 ft.) of the prow abruptly lifts in a matter of seconds. The whole operation has taken only 15 minutes. Ninety metres (300 ft.) of the vessel now extend into the ocean, exerting a strong stabilizing influence. In the working portion of FLIP are four stories for use of crew and scientists (photo right). FLIP has already made 34 expeditions, and once remained vertical for 27 days. In 10 metre (35 ft.) waves its vertical oscillation was less than 7 cm. (3 in.)

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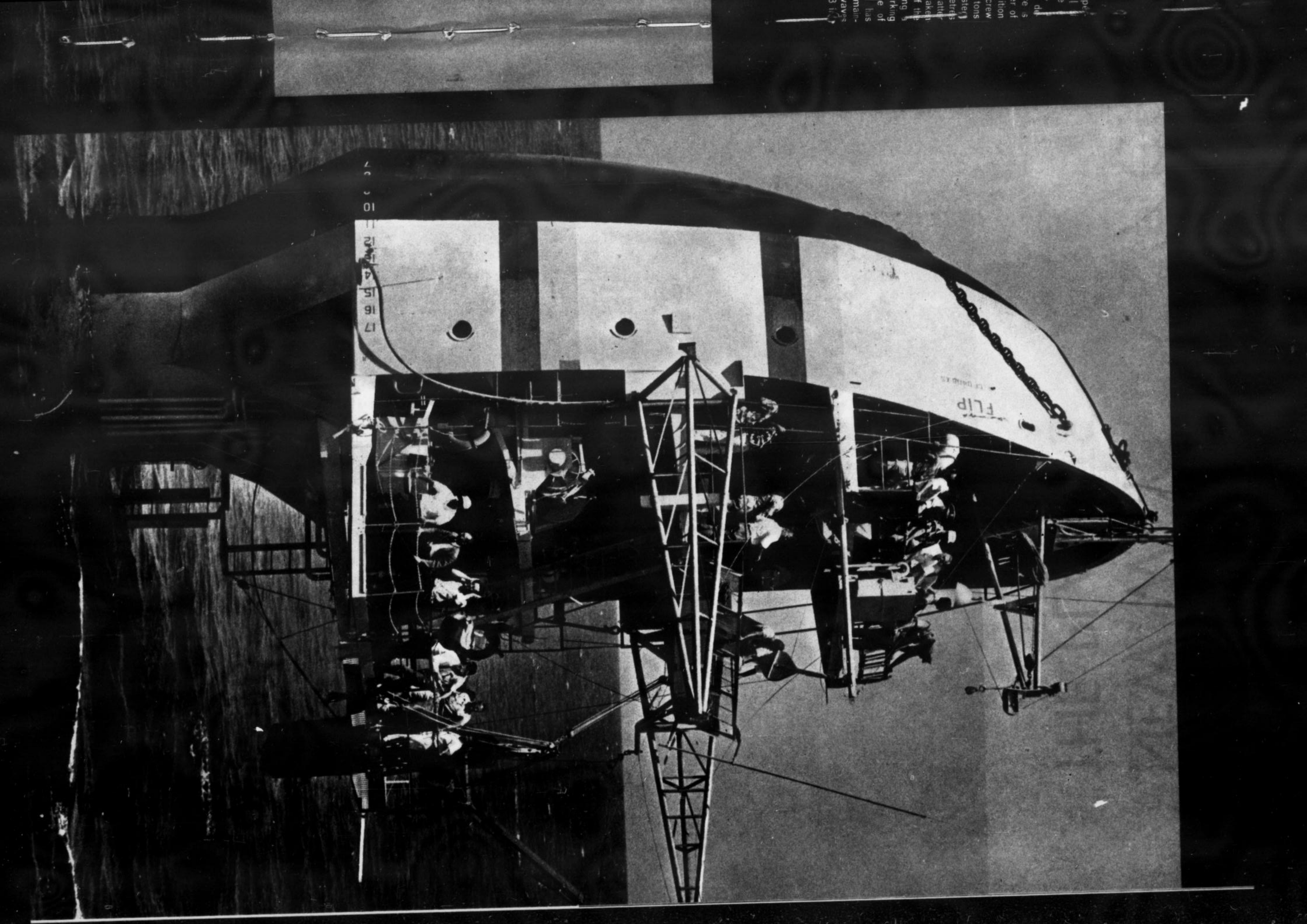
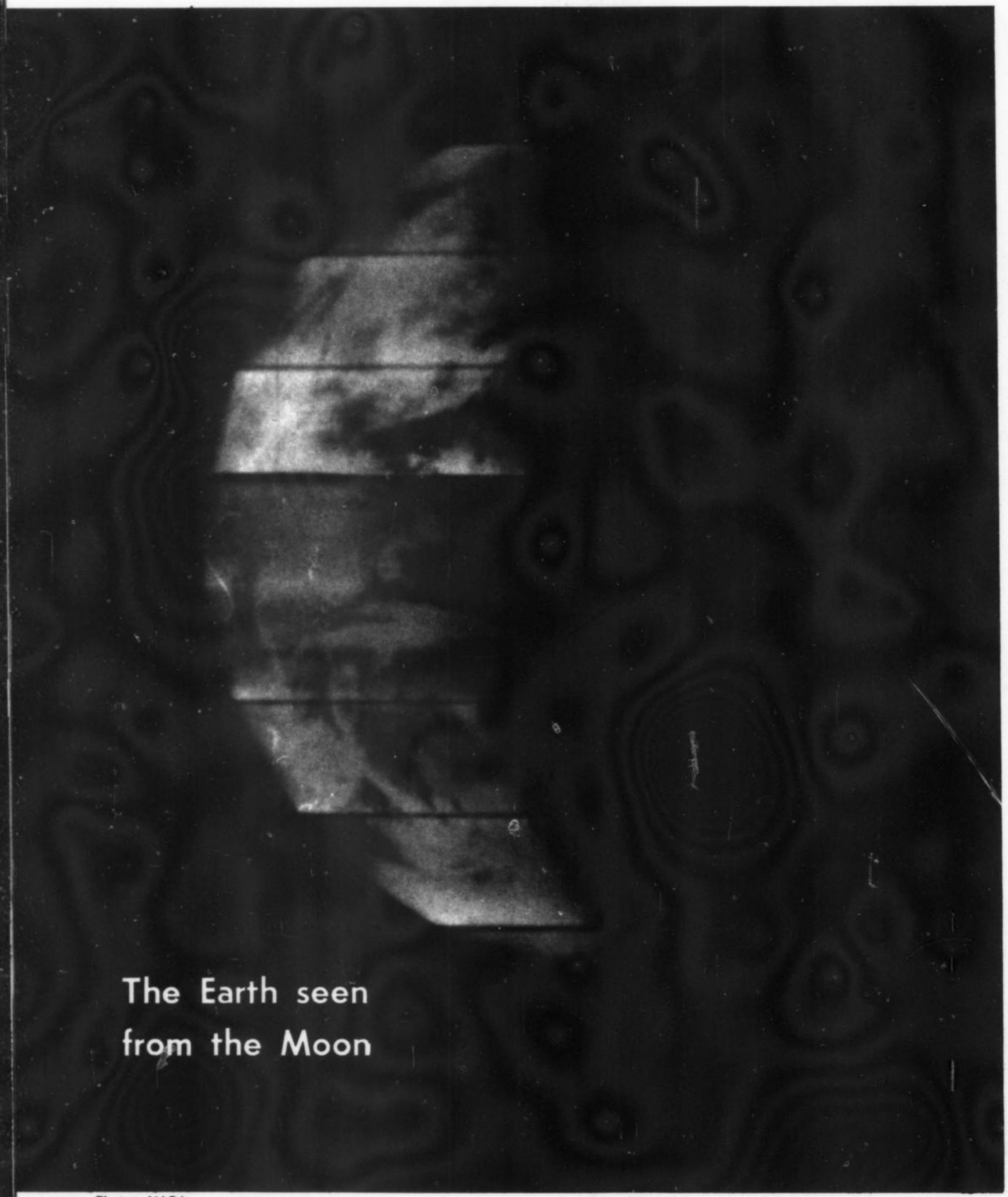


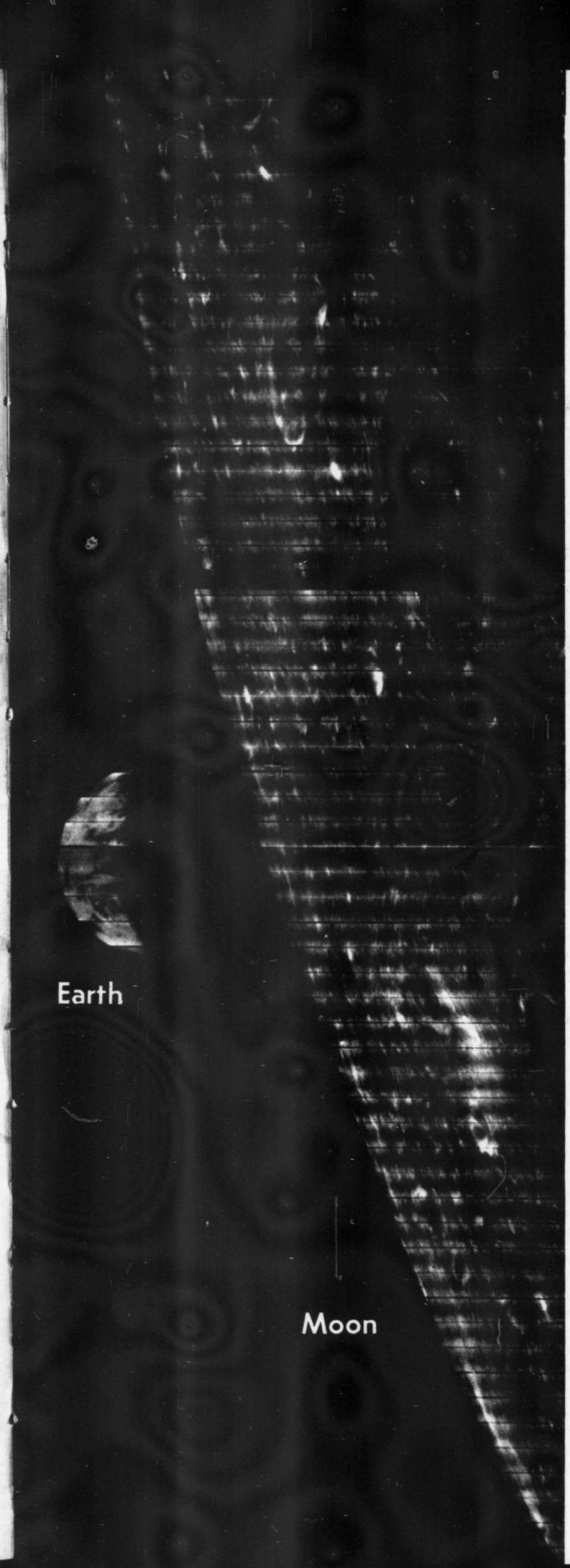
NEW WAYS TO EXPLORE THE PLANETS



The Earth seen
from the Moon

Photos NASA

Though it appears to be a crescent moon in the night sky, this object is actually the earth photographed for the first time from deep space—from a distance of over 380,000 kms (236,000 miles)—by the U.S. spacecraft, Lunar Orbiter I, as it made its 16th orbit of the moon on August 23, 1966. Complete photo (right) shows part of the lunar surface, only 27 miles beneath the spacecraft.



by
William H. Pickering

FOR many centuries, the planets of the solar system have been objects of study by astronomers. Before the invention of the telescope, these studies were restricted to an attempt to understand and predict their motion.

Very precise observations in the late sixteenth century led to the conclusion that the planets moved in orbits around the sun, and from this, the modern concept of the solar system was established.

Telescopes and accurate clocks allowed even more precise observations, and outer planets, Neptune and Pluto, were discovered.

Telescopes also provided astronomers with their first evidence of the sizes and surface appearances of the planets, and of the existence of their moons.

Then came the space programme, and the possibility of performing experiments on, or at least near to, other planets. Not only have active flight programmes of planetary investigation been established by the U.S. National Aeronautics and Space Administration, but also ground-based observations have been greatly strengthened. Scientists from many disciplines including biology, geology, physics and chemistry, have found opportunities to conduct research in this new field of planetology.

Since World War II, many devices other than rockets have extended man's capability for planetary research. For example, telescopic observations have been improved by the use of better photographic film, including colour film, and by various electronic instru-

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DR. WILLIAM H. PICKERING *has been director of the Jet Propulsion Laboratory, California Institute of Technology, Pasadena, U.S.A., since 1954. The Caltec Jet Propulsion Laboratory, as it is known, has been involved in rocket propulsion and space flight since 1936. It was responsible for the launching of the first rocket to enter space in 1949, the launching of the first U.S. satellite, Explorer I, in 1958 and the development of the U.S. Ranger, Mariner and Surveyor spacecraft.*

Venus turns slowly counterclockwise

ments. Sensitive infra-red detectors have become available. Spectroscopy has taken advantage of improved technology. Radio telescopes have become sensitive enough to make planetary measurements.

Within the past few years still greater steps have been taken. Telescopes have been lifted above the atmosphere with balloons. Radar signals have been reflected from the planets. Spacecraft have been sent to the vicinity of Venus and Mars. Soon an astronomical observatory will be orbiting the earth. Spacecraft will be sent to orbit nearby planets, and capsules from them will land on the surface.

The first radar echo observed from any heavenly body was in January 1946, when a group of U.S. Army Signal Corps engineers succeeded in detecting a signal reflected from the moon. By 1961, echoes had been detected from the planet Venus. Considering that the distance to Venus is more than 100 times as great as that to the moon, this is an indication of the remarkable improvement in radar technology during this period of 15 years.

But it is not sufficient merely to detect an echo from a planet. Useful scientific information requires measurement of the properties of the echo. The time at which the echo occurs gives the range to the target. Echo power provides information on the scattering properties of the target. The echo's radio frequency shift measures the relative velocity of target and receiver. Frequency dispersion measures the rotation of the target, relative to a line perpendicular to the direction of the receiver. Results obtained by these methods have proved that radar is an exceedingly valuable new tool for planetary exploration.

The distance from earth to the planet Venus has been measured to an accuracy of about 25 kilometres (15 miles). These data supplement astronomical observations in a useful way. Astronomical data consist of angle measurements versus time. By adding precise range to the astronomical data, the geometry and motions of the planets can be calculated to a very much greater precision than formerly.

Venus is a particularly interesting case because astronomical observations had not been able to establish any definite rotation rate since no visible fixed surface features were available. Spectroscopic observations indicated a very slow rotation but the data contained large uncertainties. The radar data showed unequivocally that Venus does indeed rotate slowly counterclockwise with a rotation period of about 250 days.

Radar observations of Mercury and Mars have also yielded useful information. Jupiter has been detected by radar both at the U.S. Jet Propulsion Laboratory and by a U.S.S.R. group. Because of the great distance, and the large frequency dispersion due to rotation of the planet, Jupiter turns out to be a very difficult target.

Planetary radar offers many opportunities for extended research activities. Systems are becoming more sensitive as transmitter power and antenna diameters increase while receiver temperatures go lower. Other than the moon, Venus will continue to be the most attractive target. Continuing study will provide a radar map of the planet.

Within the past five years the possibility of sending instruments to the planets has advanced from speculation to reality. The United States has successfully sent two spacecraft to other planets: Mariner II to Venus and Mariner IV to Mars. The Soviet Union sent a number of probes towards Venus, and after a three-month flight, the Soviet Venera 3 probe reached the surface of the planet on March I, 1966.

These flights clearly open up a whole new era in planetology.

As a practical matter, the energy available from a booster rocket is limited and, therefore, on most missions the spacecraft will fly to another planet along an orbit which requires minimum energy. To come near the target planet, it will be necessary to launch at a specified time when the earth and the planet are in the correct relative positions.

This means that launch, and arrival at the planet, occur at times determined by solar-system geometry. If, therefore, an experiment requires observations at some particular season on Mars, a flight will be possible only at certain launch periods.

Because the orbits of the planets are on different planes, the energy required to send a spacecraft to another planet varies with the launch date. For example, in the case of Mars the lowest

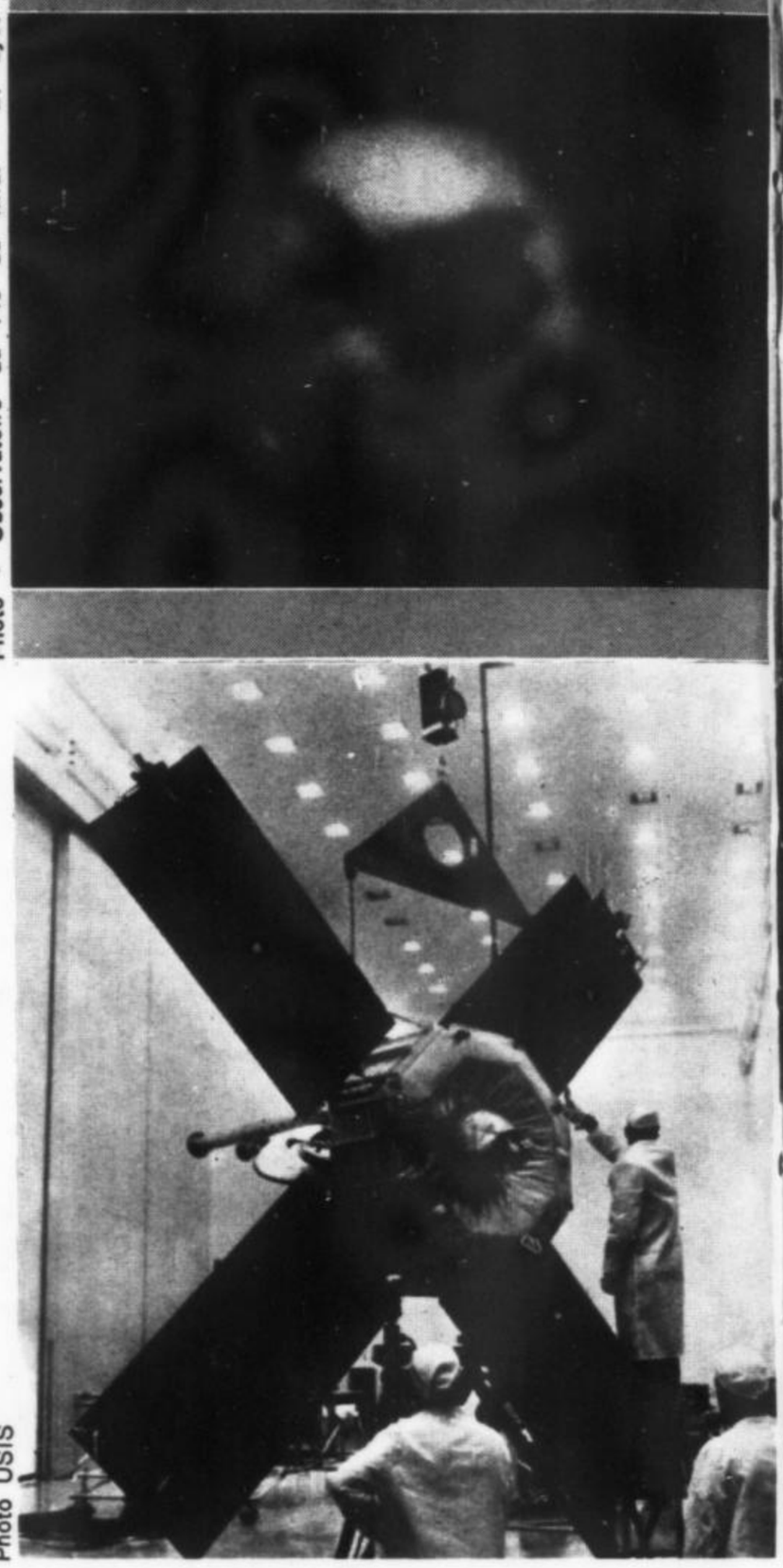

Photo - Observatoire du Pic du Midi - B. Lyot

Photo USIS

minimum energy orbit will occur in 1969 and the highest in 1973. The cycle repeats in a 15-year period. The 1969 launch requires that the spacecraft leave the earth's gravitational field with a velocity of 2.8 kms. (1.7 miles) per second. In 1973, this will rise to 4.0 kms (2.5 miles) a second. The size of spacecraft which can be launched with a given booster will vary accordingly.

Data sent back to earth from spacecraft in the vicinity of a planet must travel vast distances. Hence, the communication system must be designed so that the maximum data rate is kept as low as possible. The instrumentation selected for the spacecraft must therefore be designed to satisfy the low data requirement, or else must provide a data storage system able to collect data over a short period of time and send it over the communication link sufficiently slowly to meet the rate specification.

Instruments designed to fly on a spacecraft must, of course, operate in the spacecraft environment. This environment can be divided into three

FIRST CLOSE-UP OF MARS

In the 350 years since the telescope was invented, probably more time has been devoted to viewing and photographing Mars than to any other planet. Its varied colouring and polar caps, which appear to change with the seasons, and its straight-line markings suggestive of a rectangular network of canals have given rise to all kinds of theories. Top left, this view of Mars is representative of the best that can be made with the aid of earth-bound telescopes. Henceforth, observations obtained through space probes are likely to clear up many of the mysteries of Mars. On July 14, 1965, the U.S. spacecraft, Mariner IV, after a 228-day trip came within some 9,650 kms. (6,000 miles) of Mars and took a series of photos of the planet. Right, on one of these photos a series of giant craters is visible. Bottom left, Mariner IV being prepared. The four arms are solar batteries to power instruments. At centre, protected by cover, is a television camera.

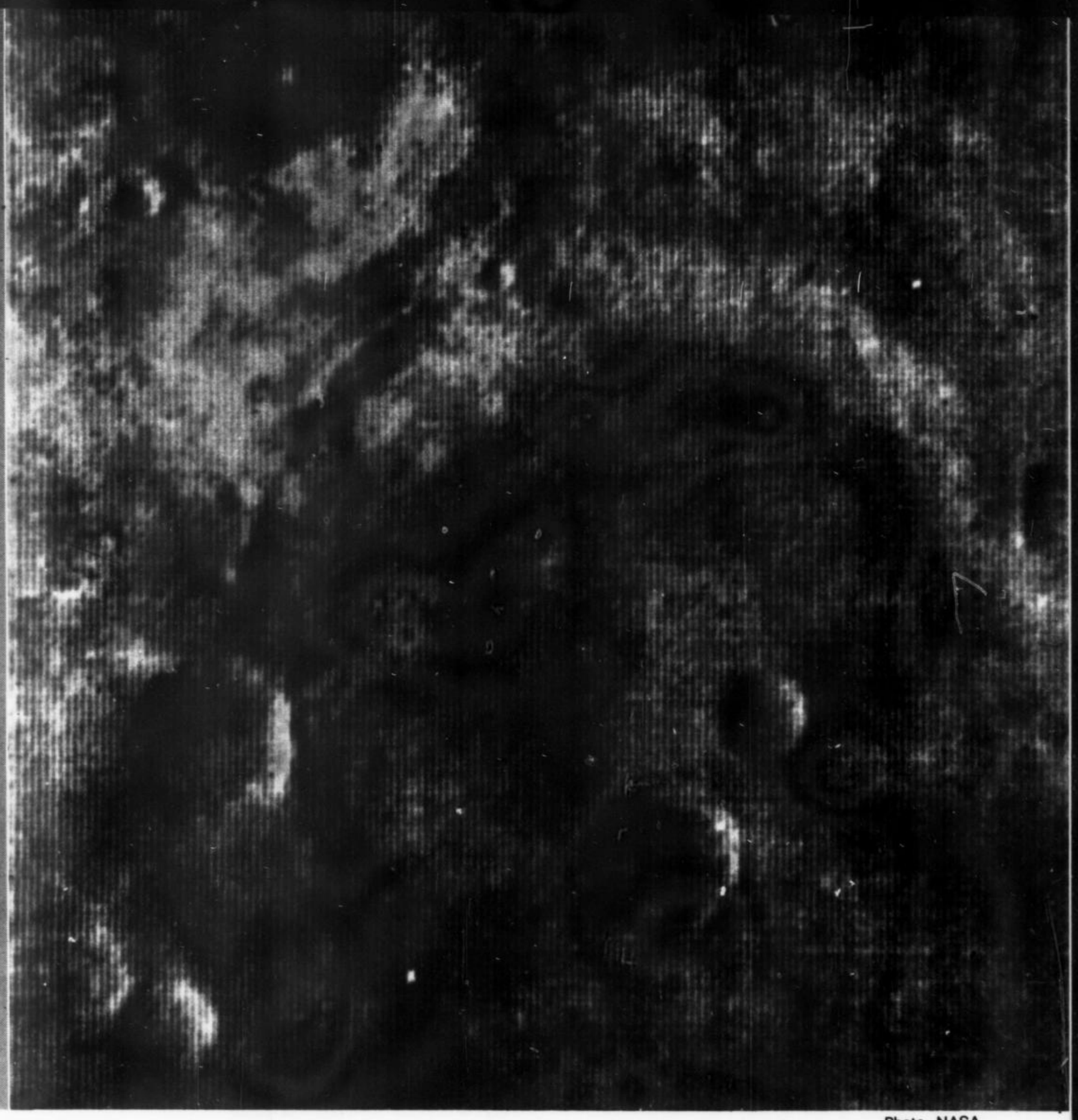

Photo NASA

categories: launch, free-fall in the vacuum of space, and landing on another planet or re-entry and landing on the earth. Each category has its problems.

The launch is characterized primarily by severe vibration and acceleration. Coasting in space presents problems due to the long exposure to a vacuum. The landing or re-entry period presents further vibration and acceleration problems, possibly complicated by the gaseous constituents of a planetary atmosphere.

While instruments have been built to operate properly in each of these environments, it is not an easy task. The worst environment is usually the vibration at launch. But the effects of a vacuum should not be minimized. These may include evaporation of instrument materials; problems of lubrication of bearing surfaces; and temperature problems caused by the disappearance of convective cooling.

Electrical problems may arise due to the passage through the atmosphere from sea level pressure to the vacuum of space, or from leakage of sealed compartments.

In addition to the environmental constraints, the instrument designer must live with weight, volume and power consumption specifications. On most spacecraft to date, these constraints have been quite stringent. However, looking into the future when larger boost vehicles become available, they should be relaxed..

A spacecraft designed to land instruments on another planet introduces still another constraint, namely the requirement for biological sterilization. One of the very interesting experiments which will be conducted on the surface of Mars is the search for life. Therefore, all space flight apparatus which has any probability of landing on Mars must be sterile to insure that life forms from earth will not be transported to the planet.

The methods by which a large spacecraft can be made completely sterile, and maintained in that condition through the launching, are currently being developed. One possibility is a requirement that the complete spacecraft be sterilized by heating above the boiling point for an extended period of time. In this case, of course, instruments would have to be constructed out of materials and components which could stand such treatment.

Finally, there is the question of reliability on the long journey through space. Some instruments are required to work continuously for many months. Others are needed only in the vicinity of the planet. These must turn on reliably, with the correct calibrations, after the long exposure to space vacuum and radiations. All equipment aboard the spacecraft must operate perfectly the first and only time it is given a completely realistic test. Once the launch button has been pushed there is no opportunity to make an adjustment or to replace a component.

Mariner IV, which flew past Mars on July 14, 1965, illustrates the scientific instruments aboard a planetary spacecraft.

In Mariner IV, the television system, mounted on a platform, was designed to scan the sky near the planet until a photoelectric device "locked on" to

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Jupiter and its moons

Jupiter, the largest of the planets, has a volume nearly 1,300 times that of the earth. Only Venus is brighter than Jupiter, whose surface is hidden by bands of clouds. Twelve satellites orbit the giant planet, and the four largest—discovered by Galileo—are about the size of our moon. This view of Jupiter, taken through a telescope in 1962, reveals the satellite Ganymede (far left); Ganymede's shadow (darker circle at centre) and the satellite Io (white disc at right).

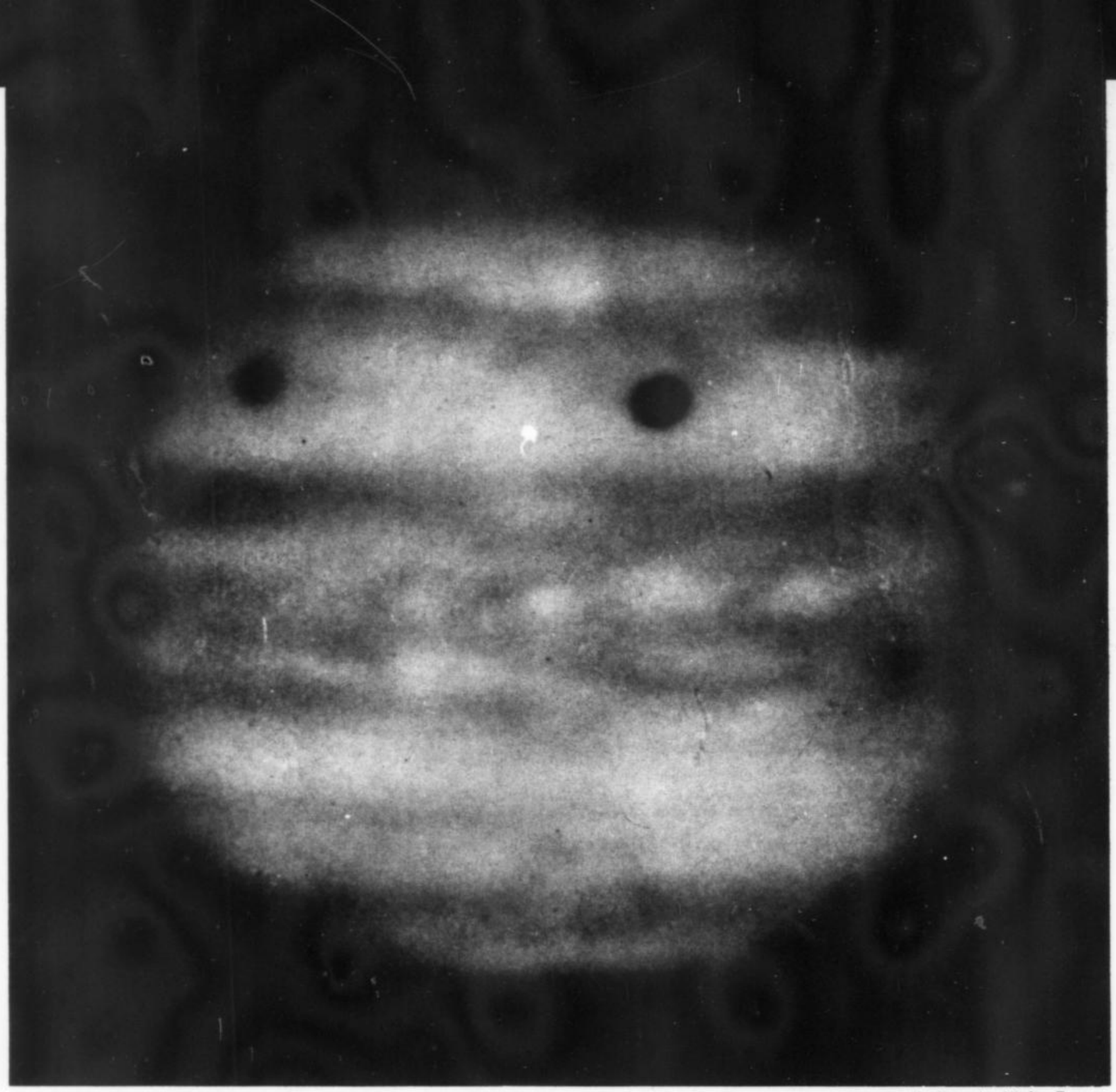

Photo - Observatoire du Pic du Midi, France

Unmanned spacecraft for the solar system

the planet and pointed the camera in the proper direction. The platform remained fixed while the motion of the spacecraft across the planet allowed the camera to take a series of photographs of the surface. These were stored on a magnetic tape and later played back to earth. The television system weighed 5 kilogrammes (11 pounds) and required 8 watts of power.

Data from these instruments, and from 90 others measuring spacecraft performance, were collected in a data automation system, processed into "digital" form, and routed to the transmitter in the correct sequence. This data automation system contained about 11,000 components. It weighed 5.4 kilogrammes (12 pounds) and required 6.5 watts of power.

The large amount of data received from Mariner was processed at the Space Flight Operation Facility in Pasadena, California. Within five minutes of receipt of the telemetry signal, both scientific and engineering data were available for initial evaluation.

During the spacecraft's seven-month journey to Mars, weekly summary reports and tapes were made available to each experimenter at the laboratory. The final data are being collected into a master data library. There, the Mariner-transmitted data, organized into digital form, are available for computer processing by the experimenters.

Mariner IV represents the most sophisticated planetary spacecraft the U.S. has yet launched. It performed very well, but its capability was limited by the 258-kilogramme (525-pound) total weight constraint. The next generation of spacecraft, the Voyager series, will weigh more than ten times as much and will be capable of missions considerably more extensive.

Present plans call for both orbiting and landing versions of Voyager, starting in 1971, for Mars exploration. Later, Voyager will be used for a Venus mission and possibly for others. The detailed plans for the first Voyager are not yet complete. Many experiments have been proposed and are now under consideration.

Exploration of the solar system has indeed entered a new era. The two foregoing examples—planetary radar experiments from the earth, and spacecraft experiments at other planets—offer spectacular opportunities for investigating our neighbouring planets.

Radar experiments have shown that solar system geometrical relationship can be determined with extreme accuracy, and that extensive new information on planetary surfaces can be obtained to supplement that from observation with visible or infra-red light.

Unmanned spacecraft travelling to the planets have demonstrated that complex experiments can be operated successfully at planetary distances, and that these craft can obtain much important information and permit close-up observations of the planets with television and other instruments.

Eventually such craft may convey data from instruments landed on a planet. Soft landings on the moon have already been achieved by the Soviet Union with Lunik 9 and by the United States with Surveyor I.

Although a soft planetary landing has not yet been demonstrated, the results of Mariner and the work of Surveyor I give us every confidence that Voyager will indeed succeed in making surface observations of Mars.

Unesco collection of world literature

On these pages we present two outstanding writers who deserve to be better known beyond their national frontiers than they are. The first is the Japanese novelist, Natsume Soseki, whose books have attained phenomenal popularity in Japan in the 50 years since his death. The second is the epic poet, Shota Rustaveli, author of the greatest and most popular work of Georgian literature. Both writers have been published in the Unesco Collection of Representative Works. The Collection, sponsored by Unesco in collaboration with commercial publishing houses, has made it possible for new audiences to read masterpieces of world literature hitherto beyond the reach of all but readers of the original texts. Over 200 volumes have been published to date in various languages, and each year the Collection is enriched by new translations from Persian, Arabic, Chinese, Indian, Japanese, Latin American and African literature (translations of more than 100 works are now in preparation). In a two-way flow of literature, classics and contemporary works are translated into French, English, German, Spanish and Italian, and great works of European literature are translated into the languages of the Orient.

SOSEKI the most popular writer in Japan

Photo © Japan Times

Soseki Natsume (1867-1916). His immense scholarship gave him a balanced view of Western literature and the Oriental classics.

NATSUME KINNOSUKE, who is generally known by his pen-name, "Soseki," is the most widely read and popular writer in Japan. Soseki was born in 1867, a year before the Meiji restoration, and died in 1916 at the age of 49.

A Soseki exhibition was held last January at a major Tokyo department store on the occasion of the 100th anniversary of Soseki's birth (Japanese custom counts the year of birth twice). More than 40,000 persons attended, establishing a new record for exhibitions for the department store.

The popularity of Soseki's novels today is considered quite phenomenal even for Japan. One leading Japanese publisher, Iwanami Shoten, began publishing a complete collection of Soseki's works in December 1965, and over 100,000 persons subscribed for the series of 16 volumes, each priced at 1,200 yen (over $3.00) and containing 700 pages.

This year, with the publication of the seventh complete set of Soseki's works, the total number of his volumes has reached the impressive figure of 6,450,000, an unprecedented event in Japanese publishing for a writer dead 50 years.

Soseki's books appeal to a broad cross-section of Japan's population—housewives, factory employees, white-collar workers, college students and even secondary and primary school children. A survey conducted in 1964 in five leading Tokyo secondary schools revealed that Soseki was the most popular author read by young people today. Paperback editions of his books now sell as fast as those of the biggest Japanese best-sellers.

Soseki started out as a secondary school teacher of English, and then went on to teach at college. He studied in England for several years, and on his return to Japan he was appointed lecturer in English literature at the Tokyo Imperial University.

In 1906, at the age of 39, Soseki wrote his first novel, "I Am a Cat", a humorous, satirical commentary on modern society. The novel was an immediate success and it enabled Soseki to resign his university post and to devote himself to a literary career. In the eleven brief years before his death, Soseki wrote

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THE THREE-CORNERED WORLD

by Natsume Soseki

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GOING up a mountain track, I fell to thinking.

Approach everything rationally, and you become harsh. Pole along in the stream of emotions, and you will be swept away by the current. Give free to your desires, and you become uncomfortably confined. It is not a very agreeable place to live, this world of ours.

When the unpleasantness increases, you want to draw yourself up to some place where life is easier. It is just at the point when you first realize that life will be no more agreeable no matter what heights you may attain, that a poem may be given birth, or a picture created...

...There is no escape from this world. If, therefore, you find life hard, there is nothing to be done but settle yourself as comfortably as you can during the unpleasant times, although you may only succeed in this for short periods, and thus make life's brief span bearable. It is here that the vocation of the artist comes into being, and here that the painter receives his divine commission. Thank heaven for all those who in devious ways by their art, bring tranquillity to the world, and enrich men's hearts.

Strip off from the world all those cares and worries which make it an unpleasant place in which to live, and picture before you instead a world of graciousness. You now have music, a painting, or poetry, or sculpture. I would go farther, and say that it is not even necessary to make this vision a reality. Merely conjure up the image before your eyes, and poetry will burst into life and songs pour forth. Before even committing your thoughts to paper, you will feel the crystal tinkling, as of a tiny bell, well up within you; and the whole range of colours will of their own accord, and in all their brilliance, imprint themselves on your mind's eye, though your canvas stands on its easel, as yet untouched by the brush. It is enough that you are able to take this view of life, and see this decadent, sullied and vulgar world purified and beautiful in the camera of your innermost soul.

Even the poet whose thoughts have never found expression in a single verse, or the painter who possesses no colours, and has never painted so much as a single square foot of canvas, can obtain salvation, and be delivered from earthly desires and passions. They can enter at will a world of undefiled purity, and throwing off the yoke of avarice and self interest, are able to build up a peerless and unequalled universe. Thus in all this, they are happier than the rich and famous; than any lord or prince that ever lived; happier indeed than all those on whom this vulgar world lavishes her affections.

After twenty years of life I realized that this is a world worth living in. At twenty five I saw that, just as light and darkness are but opposite sides of the same thing, so wherever the sunlight falls it must of necessity cast a shadow. Today, at thirty my thoughts are these : In the depths of joy dwells sorrow, and the greater the happiness the greater the pain. Try to tear joy and sorrow apart, and you lose your hold on life. Try to cast them to one side, and the world crumbles...

...It was just as my meandering thoughts reached this point, that my right foot came down suddenly on the edge of a loose angular rock, and I slipped. To compensate for my left foot, which I had hastily shot out in an effort to keep my balance, the rest of me—dropped! Fortunately I came down on to a boulder about three feet across, and all that happened was that my colour-box, which I had been carrying slung from my shoulder, jerked forward from under my arm. Luckily no damage was done.

As I rose and looked around me, I noticed away off to the left of the track a towering peak shaped like an inverted bucket. It was completely covered from base to summit with dark-green foliage, but whether cryptomeria or cypress I was unable to tell.

This text, which is copyright ©, is taken from The Three Cornered World, *published in the Unesco Collection of Representative Works (Japanese Series) by Peter Owen Ltd., London. The book is a translation by Alan Turney of Soseki's novel* Kusa. Makura *(literally, Pillow of Grass).*

THE MOST POPULAR WRITER IN JAPAN

(Continued)

numerous books, since acknowledged as literary masterpieces.

As a writer, Soseki sought to harmonize the ideas of the Occident and the traditions of Japanese literature, and to express simply and clearly, the innermost human hopes and desires. His work was also influenced by the spirit of social responsibility that characterized his contemporaries of the Meiji era.

One reason why the works of Soseki are so popular is that the majority of his novels are woven around an ordinary family and household, with which readers can readily identify themselves.

Soseki's most popular novel is probably *Botchan*, his second book, which describes the life of teachers in a provincial secondary school. This novel, based on Soseki's own experiences as a secondary school teacher, has sold more than 2,140,000 copies since 1945 in paperbound pocket editions alone.

Soseki's extensive study of English literature added to his knowledge of Oriental classics gave him a breadth

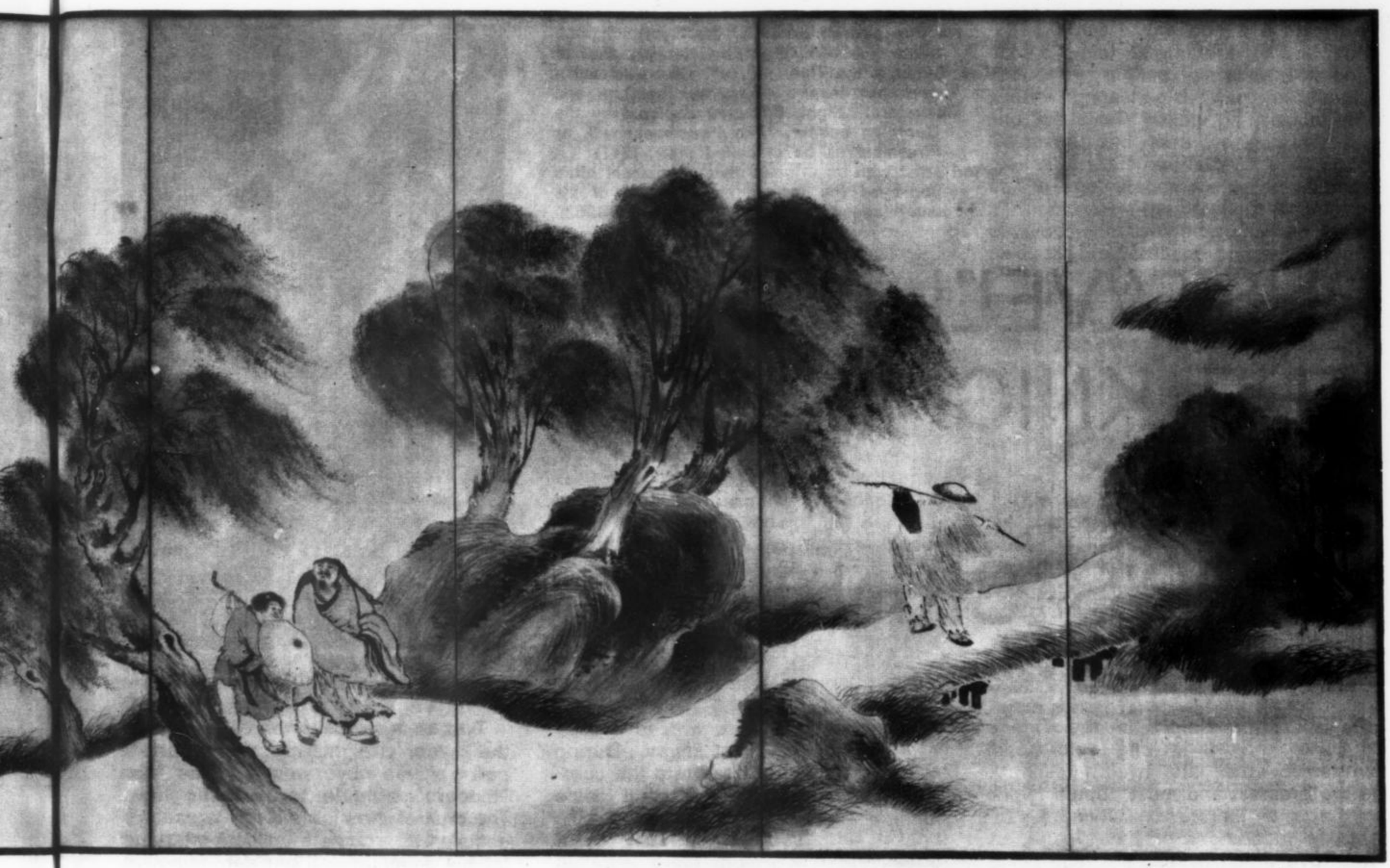

Photo © Smithsonian Institution, Freer Gallery of Art, Washington D.C.

"Figures and wind in willows", by the Japanese painter and poet, Yosa Buson (1716-1783), whose works were greatly admired by Soseki. This landscape is painted on one of a pair of silk six-fold screens in ink and colours.

of background unique among his contemporaries, and in his last years this enabled him to write outstanding works such as *Sorekara, Kokoro, Mon, Michikusa* and *Meian.* These novels—the fruit of an intensive pursuit of the writer's "self"—are very different from Soseki's earlier works, which were masterpieces of wit and humour.

In his later years, Soseki frequently wrote on the theme of conflict in family life, though each time he analyzed the theme from a different standpoint. Moreover, since these later novels are more powerful and probe more deeply into the psychology of the characters, they have a greater subtlety and refinement than the author's earlier writing. Soseki delves within the minds of his characters and through them strives to reveal the nature of man's inner life.

The chief characters in the majority of Soseki's novels are men, and neither they nor even his women characters are depicted with the wealth of detail found in works by authors of the school of naturalism. On the contrary, many of the women are portrayed as intensely self-centered beings, a further affirmation of the taste for introspection displayed by Soseki—an antinaturalistic writer par excellence.

Soseki's last work, *Meian* appeared as a newspaper serial, 188 instalments of which were published before the author's death. In *Meian,* Soseki pursued to the end his efforts to elucidate the mysteries of "self".

Soseki was a man of many talents, well versed in Japanese, Chinese and Western literature, and before becoming an author he had already established his reputation as a poet.

Under the pen name of "Gudabutsu", he wrote a great many Japanese *Haiku* poems in which he gives profound expression to such great concepts of Zen philosophy as "selflessness" and "quietude".

Soseki also excelled at calligraphy and painting and composed poems in Chinese. When he first took up calligraphy, he was greatly influenced by the work of the Zen priest, Ryokan (1757-1831), but later changed his style completely, and created his own highly original calligraphic forms.

In art, Soseki apparently preferred Japanese painting to Western-style oils. He started painting in water-colour around 1904, but it was only after 1913 that he concentrated his efforts in this field, after he became acquainted with the painter Seifu Tsuda.

Few writers today in Japan possess talent comparable with that of Soseki. Still fewer writers have left as many excellent paintings as those from Soseki's brush.

Following is a list of works by Soseki translated into English: Kokoro, *translated by Ineko Kondo (Kenkyusha, 1941), also published in French in the Unesco Collection of Representative Works (Gallimard, 1957);* Botchan, *translated by Yasotaro Mohri (Kinseido,* 1947); Ten Nights' Dreams and Our Cat's Grave, *translated by Sankichi Hata and Dofu Shirai (Tokyo News Service, 1949);* I Am a Cat, *translated by Katsue Shibata and Motonari Kai (Kenkyusha, 1961);* The Three Cornered World, *translated by Alan Turney (Peter Owen Ltd., London 1965). A translation of* Michikusa, *by E. McClellan, is in preparation for the Unesco Collection of Representative Works.*

No true portrait exists of the Georgian poet, Shota Rustaveli, the 12th-century author of "The Knight in the Tiger's Skin". But Rustaveli's work has inspired numerous painters and illustrators. Right, Rustaveli depicted by the Georgian painter, Niko Pirosmanashvili, or Pirosmani as he is called (1860-1917). A gifted artist with an original style, Pirosmani often portrayed the history and legends of his country (see the Unesco Courier, Oct. 1962).

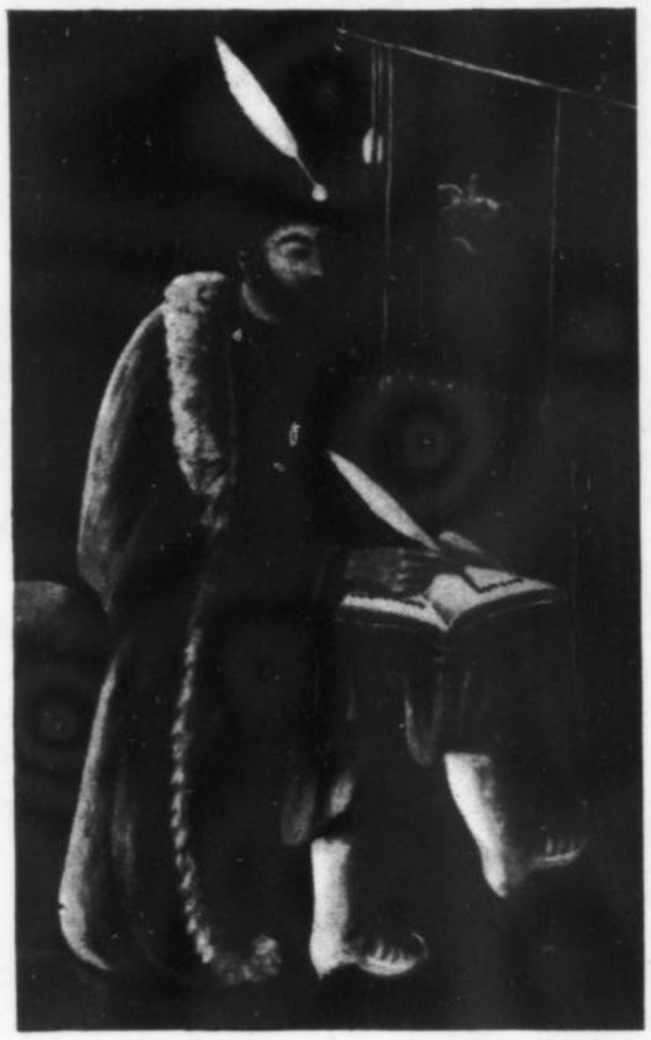

Photo © APN

RUSTAVELI AND 'THE KNIGHT IN THE TIGER'S SKIN'

by Irakle Abashidze

The Knight in the Tiger's Skin, a long epic poem written in the late twelfth century, is the greatest and most popular work of Georgian literature. But more than this, it is a story of the triumph of true love which deserves a high place in the annals of world literature, and, as we shall see, it has several features which make it especially attractive to the modern reader.

The author, Shota Rustaveli, lived 800 years ago, in the "Golden Age" of the Georgian people, when the State of Georgia stretched from the Caspian to the Black Sea and from the Caucasus Mountains to the headwaters of the Euphrates. Rustaveli was a feudal aristocrat about whom remarkably little is known; contemporary chronicles, although they describe the life and work of even minor figures of the epoch, hardly mention his name. *The Knight in the Tiger's Skin* (known in some English translations as "The Man of the Panther Skin") is his only surviving work. Indeed, the principal source of historical and literary facts about him is the Prologue to the poem itself.

The plot of the poem is complex and involved, but Rustaveli unfolds it with all the mastery of a great poet, and to this day the story holds the reader enthralled.

In his old age King Rostevan of Arabia, being without a male heir, vests the sovereignty of the realm in his only daughter, the beautiful and intelligent Tinatin, who is in love with Avtandil, a valiant knight. During a hunt arranged to celebrate the coronation, Rostevan and Avtandil come upon a mysterious knight clad in a tiger's skin, sitting mournfully by a stream and weeping tears mingled with blood. After they have tried in vain to speak with him, he disappears in the twinkling of an eye.

This event upsets and depresses the old king, and Tinatin sends Avtandil to search for the strange knight. After three years of arduous wanderings, Avtandil succeeds in finding him, and the knight, whose name is Tariel, tells his sad story. He is the son of one of the seven kings of India; this king decides before his death to do homage to Parsadan, who rules over the other six kingdoms. Tariel is brought up at Parsadan's court as his heir, and one day he falls passionately in love with Parsadan's daughter, Nestan-Darejan. But Parsadan threatens to marry her to a foreign prince and to proclaim him heir to the throne. At the princess's instigation, Tariel kills his rival. As a result, the princess is severely punished and exiled, and now, after a long search, Tariel has lost all hope of finding her and has been living in the forest with the wild beasts.

Avtandil encourages him and promises him his help, and after many adventures, he discovers that Nestan-Darejan is held captive in a remote fortress. With the help of a third knight, he and Tariel attack the fortress and free the princess. Thus honour and true love triumph: the Knight in the Tiger's Skin marries Nestan-Darejan, and Avtandil returns to Tinatin. Peacefully and humanely they rule their countries and happy peoples.

Two things about this story strike the reader straightaway: the important part played by women, and the "modern" attitude to romantic love. The crux of the plot is King Parsadan's decision to arrange a political marriage for his daughter and her determination to marry only the man she loves.

By medieval standards, King Parsadan's action was absolutely reasonable and correct. It was unheard of at that time for mutual attraction to take precedence, as a foundation for marriage, over all other considerations. Rustaveli's great originality and genius is most clearly demonstrated in the fact that he made this very human situation the pivot of his whole work.

However, to explain the importance —and the brilliant characterization— of the women in *The Knight of the Tiger's Skin*, we must refer to the social and political conditions in twelfth century Georgia.

The secluded way of life for women was thoroughly alien to the Georgian people. The conversion of the Georgians to Christianity was attributed to a woman, Saint Nino of Cappadocia. (Incidentally, whereas early Christianity in the West took the form of asceticism and the denial of all earthly pleasures, in Georgia it was closely connected with the concept of fertility and life. This has a greater significance than might be supposed at first glance, and may possibly account for the extensive secular literature which appeared in Georgian in the Middle Ages side by side with religious works).

Early ecclesiastical writings had already pointed out that men and women were one and equal in the eyes of the Almighty, and Nicholas Gulaberisdze, an ecclesiastical

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IRAKLE ABASHIDZE *is a prominent Georgian poet, translator and critic. He is first secretary of the Writers' Union of the Soviet Socialist Republic of Georgia and a member of the Republic's Academy of Sciences. Among other works of poetry, he has written a book of verse devoted to Shota Rustaveli.*

writer who was a contemporary of Rustaveli's, composed a special treatise in defence and in praise of woman's honour and dignity. Finally, and perhaps most important, Rustaveli himself witnessed the splendid flowering of Georgia as a state under the reign of a woman, Queen Tamar (1184-1213), whom he praises in the Prologue to his poem.

This was indeed a culture remarkable for its richness and diversity. There were two academies which offered a truly universal education. Many major works on religion, history and philosophy were written, and a considerable number of foreign writings were translated. Still greater development was achieved in architecture, painting and music (the written music of the period has been preserved). If the "Golden Age" reached its culmination under Queen Tamar, it dawned during the rule of her ancestor, King David the Builder (1089-1125): a man of culture who was accustomed to take his library with him when he went to war, and a pious Christian who wrote psalms of a rare beauty. He showed unusual religious tolerance for his time, and took pleasure in disputing with Muslim scholars on the finer points of the tenets of Islam.

But I digress from the poem itself. The language it was written in is not so very different from modern Georgian—no more different, let us say, than the language of Shakespeare is from modern English. The poem consists of over 1,600 quatrains, the lines of each quatrain rhyming with each other, thus:

Amartıs perad shetsvalabroli tsremlisa
[banaman.
Didkhan itiris kmaman da man kalman
[shaosanaman.
Shekhspa, sheigo adjari, tskhenitsa
[sheikvana man,
Dadumdis, tsremlin mokhkvetna shav-
[man gishrisa danaman.

(Linguists may be puzzled at not finding the slightest similarity with any other language. This is not surprising: the origins of the language. like those of the Georgian people, are shrouded in mystery. The only European language which bears any similarity at all to Georgian is Basque —and even its relationship has yet to be proved).

Suffice to say that the euphonic structure of the poem is brilliant, so much so that Georgian readers are often so carried away by the musical sound and linguistic magic of Rustaveli's verses that they only begin to appreciate the content when they go back and read it over a second time.

The poem's music must of necessity be largely lost in translation. But Rustaveli's skill in story-telling, his psychological insight and his poetic imagery are of universal appeal.

For instance, many of the devices which he uses in unravelling the complicated plot foreshadow those of the modern novel: flashbacks, extensive dialogue, secondary love interests, the first description of characters through the dialogue of others, the quoting of letters. In fact this aspect—and the author's understanding of all the intricate nuances of human psychology—justify us in looking on the poem as one of the first novels in the history of European literature.

Rustaveli's imagery is so rich, and the poem's similes and metaphors fall so thick and fast, that I cannot hope to do justice to them in a few lines. I shall just mention two images, both important ones for an understanding of the poem.

The first is the tiger's skin itself. This, the leitmotif of the whole poem, is symbolic of Tariel's loved one: when she was in a rage at her father's decision to marry her against her will, she reminded him of a tigress—beautiful even in her fury. But it is also a symbol of his valour, and of his lonely life among the wild beasts.

The other is the poet's comparison of the chief characters to the sun. This is more than just a conventional epithet suggesting the sun's brightness and physical beauty. The sun for Rustaveli, and here we get into the realms of the Neo-Platonist philosophy of the age, stands for an ideal state of goodness—the highest stage of development, to which man can attain through his intellect and will-power. He constantly reminds us that his heroes and heroines are close to this state. Towards the end of the poem, after the rescue of Nestan-Darejan, we read:

"The Sun has returned and the
[darkness is dispersed,
Evil is overcome; the good prevails,
[and will endure forever."

This optimistic and positive idea of the victory of justice over arbitrary power, of good over evil, is the underlying theme of Rustaveli's work: man must go on seeking, for he can achieve complete happiness in this

CONTINUED ON NEXT PAGE

King Rostevan of Arabia meets a knight clad in a tiger's skin. The stranger is an Indian prince, Tariel, whose odyssey Rustaveli recounts in his long epic poem which ranks as a masterpiece of world literature. This miniature, decorating a manuscript of "The Knight in the Tiger's Skin", was painted by a Georgian artist, Mamuka Tavakarashvili, in 1646.

Photo © APN

The embossing and engraving of metal with ornamental designs is a traditional form of Georgian art, going back 1,000 years. After attaining its peak in the late 12th and early 13th centuries—in the reign of Queen Tamar, whose praises were sung by Rustaveli—it slowly declined and finally died out. In the past two decades a number of young Georgian artists, using the techniques of the medieval masters, have succeeded in giving not only new life, but also new expression to this ancient art.

THE KNIGHT IN THE TIGER'S SKIN *(Continued)*

world. But above all this is a poem of passion—and flesh-and-blood passion: worshipping from afar is obviously no consolation to the Knight in the Tiger's Skin! Love is seen as a spur and a signpost in the direction of higher truth and harmony, which by the same token, is not to be achieved by mystic contemplation and passive "dissolution" in the Deity after the fashion of the philosophical poetry of the East: *The Knight in the Tiger's Skin* is a philosophical and ethical code of action, of will-power. It is the triumph of the mind and of active and radiant humanism.

This makes Rustaveli's poem one of the first great works in a truly European spirit, if we understand that spirit to be the achievements and gains of mankind at the time of the Renaissance. And though he quotes from Aristotle and Plato as well as from the Bible and the Koran, it is not too much to say that Rustaveli came very close to a profound understanding of Christian philosophy as it was before it was changed by later dogmas. At the same time, he is very close to our present-day understanding of the world.

The Knight in the Tiger's Skin has been translated into many languages, including Italian, Polish, Hungarian, Rumanian, Czech, Mongolian, Spanish, Chinese, German, French and English. It has also been translated into 17 languages of the Soviet Union, where nearly 1,400,000 copies of the work have been published.

A French translation of "The Knight in the Tiger's Skin" has appeared in the Unesco Collection of Representative Works (Editions Gallimard, Paris, 1964). In 1965 this translation was awarded the Prix Langlois of the Académie Française. An English translation for the Unesco Collection is in preparation.

A STATEMENT BY ELEVEN DISTINGUISHED GEOPHYSICISTS

We publish here the letter addressed to the London* Times *by eleven distinguished scientists who participated in programmes of study and research during the International Geophysical Year and the International Years of the Quiet Sun, organized by the International Council of Scientific Unions with the assistance of Unesco.* The Times *published the letter on July 25, 1966.

December 31, 1965, marked the end of the observational phase of the International Years of the Quiet Sun. This two-year enterprise, involving the closest co-operation between scientists of no fewer than 71 countries, has been concerned with the study of the sun and the earth under conditions of minimum solar activity.

It formed a complementary enterprise to the even greater scientific co-operative project of seven years ago—the International Geophysical Year.

Both projects were organized by special committees appointed by the International Council of Scientific Unions and financial assistance was given by this Council, by Unesco, and by the participating nations.

Beyond question, the scientific achievements of these two enterprises have been immense and there can be little doubt that as a result of the IGY and IQSY, man's understanding of solar and terrestrial phenomena and of the relationship between them, has advanced to a really enormous degree. Vast stores of data have been assembled in World Data Centres located in a number of countries and are freely available for study by scientists of every country. The planning and organization of these enterprises has occupied the time and energy of innumerable scientists from all nations over a period of several years. Men of science of every nation have been brought together in a spirit of friendly understanding and co-operation which has known no barriers of nationality, race, colour, religious or political opinion.

The basic objective of both these projects could be summarized in the phrase: "The common study of our planet by all for the benefit of all," and it is certain that the objective has been achieved in full measure. These world-wide co-operative scientific projects have shown conclusively that, however many and serious are the political problems that trouble the human race, it is possible for all the nations of the world to work closely together in great enterprises for the common good.

We, the undersigned, officers of the special committees which organized the projects, wish to commend the examples of the IGY and IQSY to the peoples of all nations. At the same time, we would wish to express the earnest hope that scientific academies and governments everywhere will resolve to place this co-operation in geophysical science on a permanent basis.

In so doing, we feel that not only will the rapid advance of geophysical science be maintained but, more importantly, it is certain that this continued close co-operation between men of science from all parts of the world will make a significant contribution to the wider field of human understanding and goodwill.

V.V. BELOUSSOV
Soviet Geophysical Committee, Academy of Sciences of the U.S.S.R.
LLOYD V. BERKNER
Director, Southwest Centre for Advanced Studies, Dallas, Texas
W.J.G. BEYNON
Department of Physics, University College of Wales, Aberystwyth
SYDNEY CHAPMAN
High Altitude Observatory, Boulder, Colorado
J. COULOMB
Centre National d'Etudes Spatiales, Paris
G. LACLAVERE
Director, Institut Géographique National, Paris
HOMER E. NEWELL
National Aeronautics and Space Administration, Washington
M. NICOLET
Institut Royal Météorologique, Brussels
MARTIN A. POMERANTZ
Bartol Research Foundation, Swarthmore, Pennsylvania.
N.V. PUSHKOV
Director, Institute of Terrestrial Magnetism and Radio Wave Propagation, Academy of Sciences of the U.S.S.R.
G. RIGHINI
Director, Osservatorio Astrofisico di Arcetri, Florence

The controversy on continental drift

(Continued from page 15)

Hemisphere receives more energy to maintain wind," Prof. Bjerknes declared. "Winds increase in the North Pacific", he said, "and, at the same time, winds in the North Atlantic decrease. Europe then receives less heat from the Atlantic and experiences a colder winter."

When Prof. Bjerknes summarized his work at a press conference, a correspondent at once queried: "But why do the easterlies grow weaker?"

This is the kind of chicken-and-the-egg question that oceanographers will be able to answer fully only when they have understood the movement of great water masses transporting temperature changes over thousands of miles of ocean.

Investigations along this line in the Gulf Stream were described by Dr. John Knauss of the University of Rhode Island in the United States. Working with newly-developed current meters that remain three days on the sea floor recording on magnetic tape, Dr. Knauss concluded that the Gulf Stream extends to the bottom even in deep water. The old concept of the deep sea as a "zone of no motion" is long dead.

Dr. Knauss reasoned that if the Gulf Stream extends all the way down, then its meander pattern should be influenced by bottom topography. In other words, when the bottom rises, the Gulf Stream is more affected by the earth's rotation and wanders off its previous path.

Dr. Knauss also investigated the amount of water transported by the Gulf Stream. Measurements in the Florida Strait—relatively easy to make because the Gulf Stream is flowing between fixed banks and not through the middle of the Ocean—indicate that here it moves 35 million cubic metres of water a second. In other words, in the Florida Strait this immense "ocean river" is moving 350 times as much water as the world's greatest land river, the Amazon, whose average flow is only 100,000 cubic metres of water a second. This particular piece of research points to the need for still broader studies—an investigation of the Gulf Stream's flow in deep water for example.

Seven years from now, the Third International Oceanographic Congress will probably see many of the questions raised in Moscow answered—and many new ones posed.

From the Unesco Newsroom...

Unesco awarded Marzotto Prize for international understanding

Unesco has been awarded the Marzotto Prize created by the Marzotto Prize Institution in Italy for the person or institution making a major contribution through cultural activity to the development of understanding and co-operation among nations. Mr. René Maheu, received the prize on behalf of Unesco at a ceremony in Valdagno, Italy, in September.

Gift from Japan: $ 830,000 for Abu Simbel

Unesco has received 300,227,861 yen (over $830,000) from the Tokyo daily "Asahi-Shimbum" as a contribution towards saving the temples of Abu Simbel in Nubia. The contribution is one of the largest Unesco has received from a private source for the Nubian campaign. The money was raised by an exhibition on Tutankhamen organized in Japan by "Asahi-Shimbum" in 1965-66, and visited by some three million people. In 1963, the newspaper set up an exhibition on "Five Thousand Years of Egyptian Art" whose proceeds also went to the Nubian campaign.

Over 800 libraries linked by teletype

Eight hundred and twenty-one libraries throughout the world are now linked by teletype machines, reports the *Unesco Bulletin for Libraries*, which points out that as libraries have to rely increasingly on each others' collections to fulfil requests, the teletype is needed to speed up and simplify operations.

Indonesia to remain in Unesco

The Minister of Foreign Affairs of the Republic of Indonesia has informed the Director-General of Unesco that "Indonesia is ready to resume active participation in the work of Unesco". In February 1965, Indonesia sent notice of its withdrawal from Unesco, which was to have taken effect from December 31, 1966.

New Assistant Directors-General for Unesco

Mr. René Maheu, Director-General of Unesco, has appointed two new Assistant Directors-General. Mr. Tor Gjesdal, who has been Director of Unesco's Department of Mass Communication since 1955, becomes Assistant Director-General for Communication. Mr. Gjesdal, who was born in Norway in 1909, was Director of the United Nations Department of Public information in New York from 1946 to 1955. Mr. Mahdi Elmandjra, formerly director of the executive office of the Director-General, now becomes Assistant Director-General for Social Sciences, Human Sciences and Culture. Before joining Unesco in 1961, Mr. Elmandjra was Director-General of the Moroccan Radio and Television Organization. He was born in 1933 in Morocco.

The credit line of this photograph (published on page 17 of our July-August number) failed to indicate that this picture was originally published in "Paleocurrents and Basin Analysis" by P.E. Potter and F.J. Pettijohn. Photographer W.K. Hamblin. Berlin, Göttingen, Heidelberg: Springer-Verlag 1963. 289 p. (Plate 2).

Encyclopaedias and Civilizations

We wish to bring to our readers' attention a newly-published number of the *Journal of World History* entirely devoted to encyclopaedias and civilizations (Vol. 9, No. 3, 1966). A veritable encyclopaedia on encyclopaedias, the number spans the centuries from antiquity to the modern age and ranges over Europe, America, Asia and the Arab world, as it describes man's outstanding efforts to collect and present the immense sum of human knowledge. A quarterly review, the *Journal of World History* was initiated and is published by the International Commission for a History of the Scientific and Cultural History of Mankind, and appears under Unesco's auspices. Order from Editions de la Baconnière, Boudry, (Neuchâtel), Switzerland. Subscription : Vol. 9 (4 numbers), $15.00 of equivalent in any currency; No. 3, $5.00.

Mali aids fight against illiteracy

The Government of Mali has given Unesco two million Mali francs (over $8,000) to help the world fight against illiteracy. This gift follows the World Congress of Ministers of Education on the Eradication of Illiteracy, held in Teheran last year, at which the Shah

U.S. PRESIDENT NAMES SEPT. 8, 1966 INTERNATIONAL LITERACY DAY

September 8, 1966 was designated as International Literacy Day in a proclamation issued on August 30 by President Lyndon B. Johnson of the United States. September 8, 1966 marks the first anniversary of the opening in Teheran of the World Congress of Ministers of Education on the Eradication of Illiteracy convened by Unesco upon the initiative of the Shah of Iran.

In his proclamation, President Johnson said, in part:

"Illiteracy is the greatest single barrier to economic and social progress in many of the countries of the world. September 8, 1966, is the first anniversary of an event which I believe was the turning point in the battle against illiteracy. On that date one year ago the World Congress of Ministers of Education convened in Teheran, Iran, to consider the problem.

"That Congress, made up in part by a delegation of distinguished statesmen and scholars sent by the United States government, established the principles which now guide the highly commendable efforts of the United Nations Educational, Scientific and Cultural Organization. Through experimental projects, Unesco is creating methods, techniques and materials for full-scale literacy programmes."

The U.S. President called upon the people of his country to commemorate the day in ways most appropriate to the occasion and to co-operate with national and international organizations, private groups and individuals dedicated to the goal of eliminating the scourge of illiteracy.

In The History of Unesco in Stamps *(July-Aug. 1966; pp. 50-51), this stamp, issued by the Republic of China to commemorate the inauguration of Unesco's new Paris headquarters in 1958, was captioned, by error, as a Japanese stamp.*

Dr. Eugene Rabinowitch receives Kalinga Prize

Dr. Eugene Rabinowitch, a U.S. scientist, editor and a founder of the *Bulletin of the Atomic Scientists, a Journal of Science and Public Affairs*, received the 14th international Kalinga Prize for the Popularization of Science last month, at a ceremony in Unesco H.Q. As editor and editorial writer of the *Bulletin of the Atomic Scientists*, published in Chicago, Dr. Rabinowitch has taken an active part in the "Pugwash" movement which has held 14 conferences on science and world affairs attended by some of the world's most eminent scientists and shapers of science policy (see the Unesco Courier, Nov. 1964). A member of the faculty of the University of Illinois since 1947, Dr. Rabinowitch has published books on the implications of modern science for the world today and in the future, and also on uranium chemistry and photosynthesis. The Kalinga Prize, named after the empire ruled by the peace-loving Asoka in India 22 centuries ago, is a personal donation of Mr. Bijoyanand Patnaik, an Indian industrialist, and is awarded annually by an international jury appointed by Unesco.

of Iran urged member states of Unesco to contribute one day of their military expenditure to fight illiteracy. Iran last May gave Unesco $700,000 drawn from the Iranian military budget.

Flashes ...

■ *Many countries are gravely short of trained health workers. At least 15 African countries were still without a single medical school last year, reports WHO.*

■ *About 12 % of the world's annual fish catch comes from inland waters, says FAO, which is encouraging greater inland fish farming, especially in Africa and Latin America.*

■ *Tunisia is aiming at 100 % school enrolment by 1971. Last year, 86 % of Tunisian boys attended primary schools, but only 44 % of the girls.*

■ *A WHO study on cities reveals that in 75 countries one-third of townsfolk have running water, one-third use public fountains and the rest must make do with water from rivers, wells or gutters.*

■ *In Hong Kong over 900,000 students—one-quarter of the population—attend schools and educational courses.*

PRESERVING BOOKS ON FILM

Millions of pages of manuscripts and documents—many of them rare or unique—have been reproduced on film in the past ten years by Unesco's mobile microfilm units. Set up as a Unesco contribution to educational services, and in particular libraries, all over the world, the first microfilm unit was given a threefold mission:

■ to reproduce and thus preserve a record of documents of cultural, scientific or historical importance that might be lost through age, climatic conditions, fire and other causes;

■ to train staff in countries requesting its services;

■ to help these countries create their own microfilm services.

From 1956 to 1961 the unit worked in eight Latin American countries, reproducing almost a million and a half pages of manuscripts and other important documents. In 1962 it spent nine months in Morocco, reproducing more than half a million pages. In 1963-1964 it went on to other Arabic-speaking countries, including Syria and Egypt. By the end of 1963 it had extended its operations to Asia, and helped by a second Unesco unit it has since been introducing microfilming in Malaysia, India and other Asian countries.

Over 103,000 pages of rare manuscripts and documents were filmed at Phnom-Penh (Cambodia) by the second Unesco mobile unit between October 1964 and April 1965. Many of these manuscripts had to be brought from temples in the interior of Cambodia.

When it has been able to spare the time, this unit has also lent a hand with various local projects not really within its brief, helping with mapmaking, school television and other activities where it could save the community time and trouble.

Microfilming has become an indispensable aid for the librarian and archivist. The work of Unesco's mobile units has brought it to many countries that would otherwise have been without its help for some time to come, with the consequent deterioration or even loss of much precious material.

BOOKSHELF

■ **Population Geography**
By John I. Clarke. The geographical approach to population study and its demonstration of how variations in the distribution, composition, migrations and growth of populations are related to variations in the nature of places. (Commonwealth and International Library) Pergamon Press, 1965 (21/-).

■ **The United Nations and World Realities**
By Marc Lee. An appraisal of the United Nations since 1945. Describes how the U.N. has dealt with the complex problems within its sphere, and evaluates its success. (Commonwealth and International Library), Pergamon Press, 1965 (21/-).

■ **Towards International Co-operation**
By Sulwyn Lewis. Examines the origins of forces that divide the world and their present consequences, and studies past and present efforts to develop international co-operation. (Commonwealth and International Library) Pergamon Press, 1966 (25/-).

RECENT UNESCO BOOKS

■ **The Book Revolution**
By Robert Escarpit. An authoritative study of the important changes in the publishing world over the last few decades. It discusses the problems of writers, publishers and bookstores, and their re-adjustment under the demands of mass readership (see the Unesco Courier, Sept. 1965). A Unesco-George Harrap and Co. co-edition, 1966 (18/-;$3.50).

■ **The Psychology of the Use of Audio-Visual Aids in Primary Education**
By Prof. Gaston Mialaret. The growing use of audio-visual aids is explored in a searching international analysis of their psychological impact on teacher and pupil alike. A guide for educators who wish to use such aids intelligently. A Unesco-George Harrap and Co. co-edition, 1966 (30/-;$6.00).

■ **Africa Prospect**
By Richard Greenough. An informative account of recent educational progress in Africa as well as the problems encountered and those that remain to be solved. Unesco, 1966 (3/-;$0.50).

UNESCO'S TRANSLATIONS SERIES

From Asia

■ **Javid-Nama**
By Sir Muhammad Iqbal. Translated from the Persian with introduction and notes by A.J. Arberry, The *magnum opus* of a great Moslem poet and philosopher, *Javid Nama* describes a spiritual journey made by the poet through the spheres, during which he encounters many great figures of history with whom he holds converse. George Allen and Unwin Ltd., 1966 (27/-).

Letters to the Editor

FATHER OF THE LASER

Sir,

In your article on lasers (Feb. 1964) no mention is made of the work of Professor Jean Becquerel, of the French Academy of Science. Yet all articles—even those written on the popular science level—which describe the purposes of lasers and masers, those extraordinary amplifiers of light energy, speak of Jean Becquerel, to whose work the optical maser (laser) owes its origin.

The optics of crystals at low temperatures, a science initiated by Jean Becquerel, is today undergoing a tremendous development.

Jean Becquerel was the first to study the absorption and fluorescence spectra of the ruby and to reveal the collimation of red rays at low temperatures. Using the red rays from the ruby, Dr. T.H. Maiman, in the United States, operated the first laser in 1960. The invention of the laser is therefore clearly linked with the pioneering work of Jean Becquerel in crystal optics.

Mme. Jean Becquerel
Fontainebleau, France

OUR SHRINKING PLANET

Sir,

You published some striking facts about the unprecedented growth of the world's population in your February 1966 issue.

The Dutch live happily in their country with 356 people to every square kilometre. If Australia and New Zealand, which together cover 7,973,835 square kilometres, had a population density like that of the Netherlands, their combined population would total 2,838,685,260 or nearly as much as the present world population.

I believe the world is mis-managed because people limit themselves by boundaries which form states. Unite these states and everyone will live happily.

If everyone takes care of his neighbour no one will suffer.

H. J. Baarslag
Mt. Albert, New Zealand

WHAT IS YOUTH ?

Sir,

You have published several letters expressing appreciation of your July-August 1965 special number on youth. I, too, liked this number. But may I ask a question? What *is* youth?

Youth is just about the most relative term in the world—an arbitrary mental concept. For consider, "youth" is continuously merging into "middle age" which, in turn, is always merging into "old age." Between these so-called groups, there is an infinitude of degrees. However young you are, there is always somebody younger; however old, always somebody older.

So why speak of youth as though it is a static division of the human race? "Youth" is a disuniting label almost as dangerous as racist labels. When will we learn not to divide human beings (yes, we are all human beings) into labelled groups?

Mass circulation newspapers in Britain are always writing about "Woman" and "Women" as though they are not half the human race. But this is not quite as stupid as the present-day concept of "youth"—for youth is something we all have in some degree or have had. The human race may be divided into men and women but it is not divided into young and old. Even Shaw forgot this when he said, "Youth is a wonderful thing; what a pity to waste it on children." Far more precise was Havelock Ellis when he wrote that the climax of anti-social behaviour is reached round about the age of 20 (a fact proved by present-day criminal statistics).

Most people, to my observation, get *gradually* less violent and more tolerant as they mature in years. Eventually they come to look back on their younger days, sometimes with pleasure but often with a blush or two for the stupidities and unthinking cruelties of immaturity. Those who blush most as they remember the past are those who have matured the most. I would like to see more reverence for "Old Age" and fewer pedestals for "Youth". The greatest civilizations (the Sung dynasty for example) have revered maturity.

Bernard Charlesworth
London, England

LEARNING FROM THE WINDMILL

Sir,

I read your issue on "Our Thirsty Hungry World" (April 1966) with much interest. It made me realize how we have failed to distribute our knowledge and means of modern technology. One of the reasons is the very nature of this technology, which cannot grow and bear fruit on a soil that has not been conditioned to receive it. Fortunately this conditioning will take less time and money than it has taken in the history of now highly developed countries.

It might be good sense in the meantime to take the experience of a less highly developed technical period and put it to good use until better means will be available. I know of one field in engineering where this collected experience is available and where it could be used. For this reason I bring to your attention a review of a book about the Dutch windmills.

Prof. Dr. Ir. W.M.J. Schlosser
Eindhoven, Netherlands

The book in question, "Research Inspired by the Dutch Windmills" by the Prinsenmolen Committee, and published by H. Veenman en Zonen, Wageningen, Netherlands, deals with the design of windmills—well proven machines for raising water—on the basis of modern aerodynamics and wind tunnel tests. It presents, in 185 pages with 90 drawings, the collected information about the subject that was available in the Netherlands between 1935 and 1960—Editor.

RENDER UNTO CAESAR

Sir,

I was delighted by the article "For Children Only" (March 1966) on the remarkable children's library at Clamart, near Paris, which I visited recently with a group of librarians. Bravo, for showing readers this library which is an innovation from several viewpoints and one which we hope to see widely copied.

What a pity, though, that the name of the architect was not mentioned. Much of the library's success is due to its design, to the use of simple materials and to the excellent lighting arrangements.

In this particular case I would say that the architect has probably made a more original and novel contribution than the librarian. At any rate, it has a stimulating effect, as anyone can confirm who has seen the enthusiasm and satisfaction of the young librarians working in this field.

Eliette Segalen
Boulogne-sur-Seine, France

Not one, but four architects designed the Clamart library. They are: Messrs. J. Renaudie, P. Riboulet, G. Thurnauer and J.L. Veret—Editor.

WHY NOT A 'JUNIOR COURIER'?

Sir,

My son, aged 6, is very interested in space. I am sure he will like the pictures in your May 1966 issue. But he is too young for the text. Why not have a Junior Courier for, say, the 6 to 11 year-olds? Previous generations (and the present one) have made a poor show of bringing the world to law and order; the sooner we set the next generation off along the path to world community the better.

John Roberts
London, England

FOR FREEDOM FROM HUNGER

Sir,

As a representative of the Freedom from Hunger Campaign Committee in Beauvais, France, I should like to tell you what this group of young people is doing. A correspondent at Bossangoa (Central African Republic) suggested that we should buy millet grinders which would lighten the work of the women and also help to reduce infant mortality. Porridge made by cooking millet meal is, in fact, much more digestible than porridge made from manioc meal, but millet is harder to grind. We aim to provide ten millet grinders at a total cost of 30,000 francs (£2,100 or $6,000), and to raise this sum we have joined forces with the town of Chantilly, near Paris.

Bernard Chandellier
Beauvais, France

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The Other Unesco Periodicals

MUSEUM

A quarterly review published by Unesco

Unesco is well known for its leadership in the rescue and restoration of the ancient Egyptian temples at Abu Simbel. Architects and engineers are now re-erecting the colossal statues and carved walls 200 feet higher up the cliff to protect them from the rising waters of the Nile above the High Aswan Dam. This feat has been described with full color illustrations in several issues of the Unesco Courier.

But Unesco has also served the arts, ancient and modern —and the sciences too—since 1948 in its most distinguished quarterly, MUSEUM, a periodical printed on high-quality paper and lavishly illustrated with photographs from the museums of all the world. Its articles, though addressed primarily to museum directors, interest equally librarians, educators, museum trustees and public officials. The articles are written by international authorities; the periodical is bilingual (English and French) with summaries in Russian and Spanish.

Issue No. 1, 1966, for example, carried articles describing some of the world's new museums, including the National Museum of Anthropology in Mexico City, the Israeli Museum in Jerusalem and the recently-opened regional museum of Samay Husai in Argentina. This number also carried a survey of the world's theatrical museums.

★

Other issues have described the museums of Africa, India and the Soviet Union, among others. Special technical issues have dealt with air-conditioning in museums, the care of paintings, protection against theft and the role of the museum in the community. Recent outstanding issues have covered:

- **The role of museums in contemporary Africa—ten articles by different authors (No. 3, 1965)**
- **Aesthetic principles and general planning of educational exhibits, by Jean Gabus (Nos. 1 and 2, 1965)**

THE MUSEUM MANUALS

Equally important is Unesco's series of books and practical manuals on such topics as the organization of museums, the protection of historical monuments from war damage, and the preparation of temporary and travelling exhibitions. This series, in English and French, is basic to the museum profession and offers guidance to the museums and libraries of the world:

★

THE ORGANIZATION OF MUSEUMS
Practical Advice.
Seven outstanding experts discuss such basic problems as museum architecture; administration, staffing; exhibition management; encouragement of visitors; the care and storage of collections; the museum laboratory's role in conservation and restoration of materials; educational programs in museums and the use of museums for research by scholars and scientists.
1960. 188 pages and 44 pages of photographs. $6.00

TEMPORARY AND TRAVELLING EXHIBITIONS
The practical problems of arranging temporary and travelling exhibitions. The subjects covered are: Temporary exhibits in art museums and science museums; travelling exhibitions; packing, transportation and insurance.
1963. 123 pages with diagrams and 36 pages of photographs. $ 4.50

PROTECTION OF CULTURAL PROPERTY IN THE EVENT OF ARMED CONFLICT
Library, school, church and museum administrators profit from this book. It deals with the problems of protection throughout the full range of violence in armed conflict, from small-scale civil wars and insurrections through thermonuclear war. Practical recommendations are made regarding appropriate equipment, facilities, personnel and organization to minimize damage. Profusely illustrated with diagrams, drawings and tables.
1958. 346 pages and 58 pages of photographs. $7.50

Order from

UNESCO PUBLICATIONS CENTER, 317 EAST 34 STREET, NEW YORK, N.Y. 10016

Imp. GEORGES LANG, PARIS. IMPRIMÉ EN FRANCE

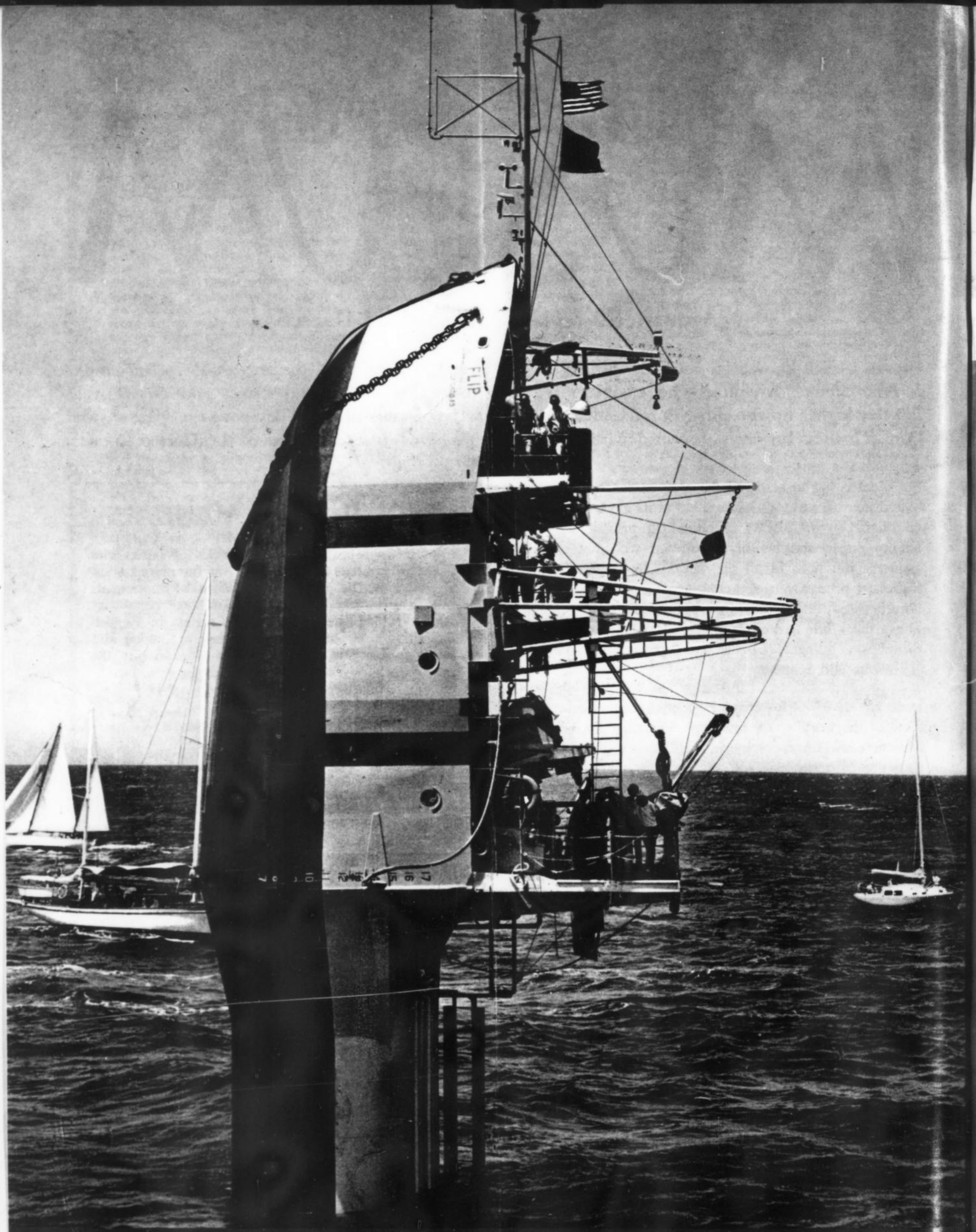

Photo © Honolulu Advertiser

SHIP NAMED FLIP. It looks like a sinking ship just before its last plunge. But "Flip"—the name stands for Floating Instrument Platform —doesn't go down. This unusual oceanographic research vessel has merely flipped up on end to enable scientists aboard to conduct experiments under stabler conditions than a surface vessel would provide (see page 18).